Ostrander Dye Trace Report
Fillmore County Minnesota

Traces:
17 May 1993

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Introduction

In the karst region of southeast Minnesota, tracing of surface and groundwater using dyes has proven to be an effective method to understand groundwater flow direction and minimum flow velocities. Since the time of this study, this technique has been used extensively to determine groundwater flow characteristics and delineate groundwater and surface water springsheds, or the area within surface water and underlying groundwater basins that contributes to a springs (or set of springs) discharge. Understanding springshed extent is important for protection of trout streams and other ecosystems from potential negative impacts associated with surface spills, land use or alteration, and water-use interferences. The boundaries of groundwater springsheds often do not correspond to surface watershed boundaries and are dynamic in their areal extent, changing as groundwater levels rise and fall. This investigation, conducted as a part of the statewide effort to delineate springsheds, consisted of two dye traces conducted near Ostrander, MN in western Fillmore County (Figure 1). While the results of these two traces did not directly result in the delineation of a springshed, they contributed to the authors' understanding of various potential pitfalls and thereby helped them to avoid mistakes in later springshed delineation efforts.

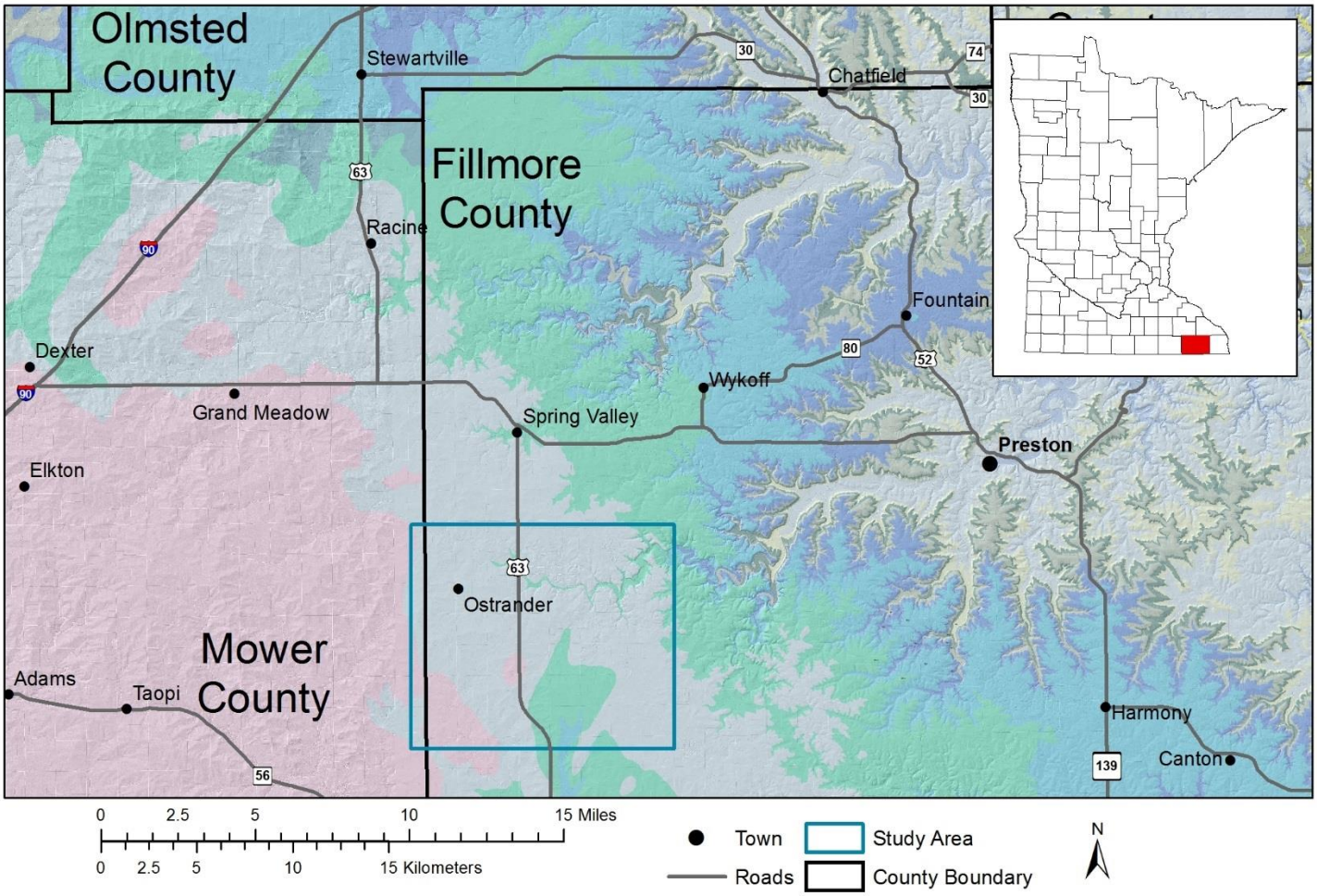

Figure 1. *Location of the Ostrander study area in Fillmore County, Minnesota. Shading used to delineate bedrock geology loosely corresponds to the shading depicted in figure 2. Geologic unit codes are summarized in Figure 2.*

Fillmore County has abundant exposures of bedrock ranging from Devonian to Upper Cambrian. These units are capped by unconsolidated Cretaceous and Quaternary age sediments such as loess, sand, and colluvium (Mossler, 1995). The surface topography is comprised of flat upland plateaus mostly underlain by resistant limestones and dolostones of the Galena Group, the Maquoketa Formation, and the Wapsipinicon and Cedar Valley Groups (Mossler and Hobbs, 1995). This upland landscape is dotted with sinkholes that allow surface water to drain through subsurface joints and conduits that have been enlarged by dissolution. Springs and seeps often occur along the base of bluff walls and entrenched

bedrock meanders (Mossler and Hobbs, 1995). A generalized geologic stratigraphic column for Fillmore County (Figure 2) shows lithostratigraphic and hydrostratigraphic properties for each of the units (modified from Runkel et. al. 2013).

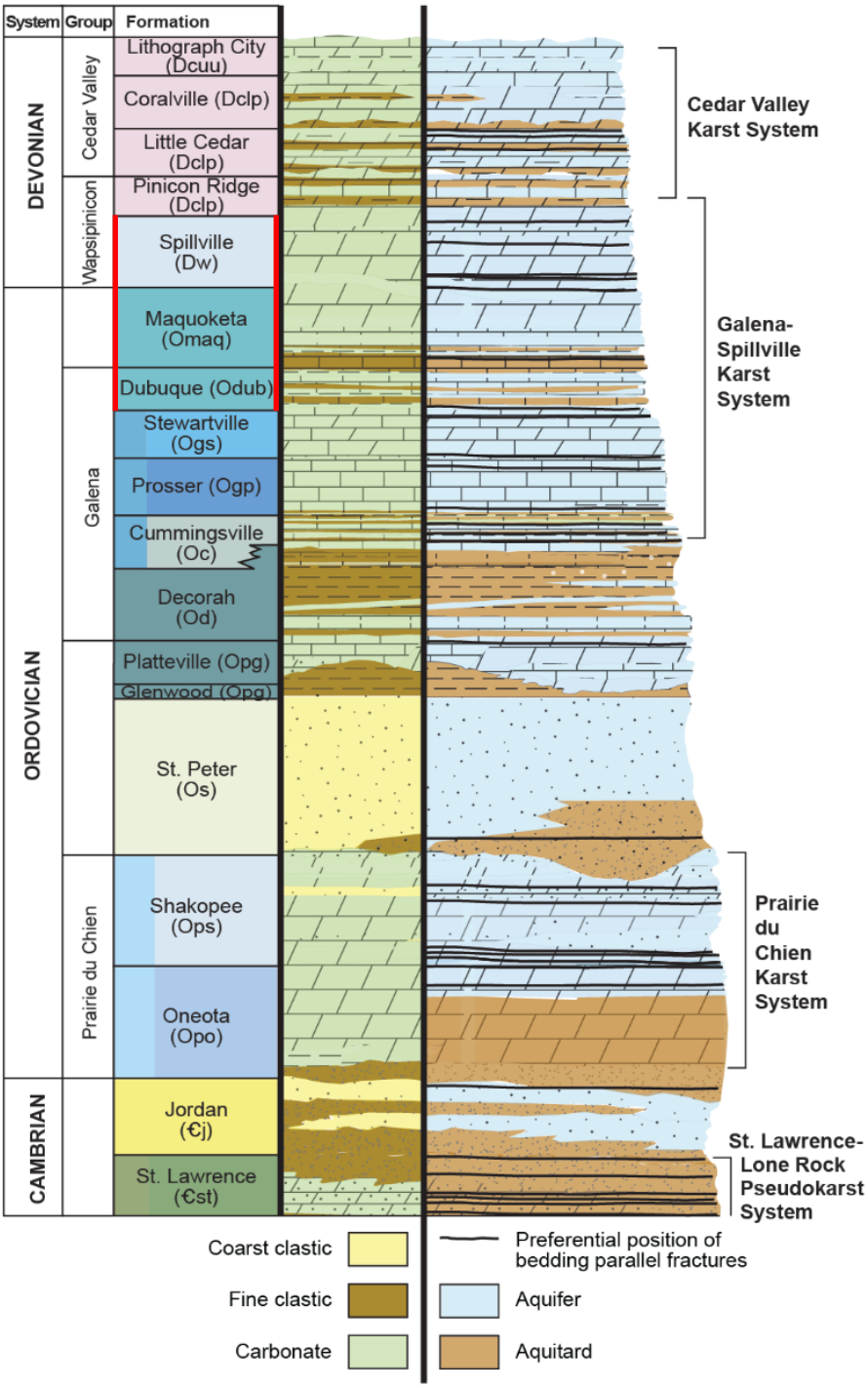

Figure 2. *Geologic and hydrogeologic attributes of Paleozoic rocks in southeastern Minnesota. Modified from Runkel et al. 2013. The current study features traces where dye was poured into the Spillville Formation and resurfaced in both the Spillville and Maquoketa-Dubuque Formations. Red lines were used above to delineate the formations involved in these traces*

Hydrostratigraphic attributes have been generalized into either aquifer or aquitard based on their relative permeability. Layers assigned as aquifers are permeable and easily transmit water through porous media, fractures or conduits. Layers assigned aquitard have lower permeability that vertically retards flow, effectively separating aquifer layers hydraulically. However, layers designated as aquitards may contain high permeability bedding plane fractures conductive enough to yield large quantities of water. This study involves two traces in the Galena-Spillville Karst Sytem, which is generally

characterized by rapid surface water infiltration into the upper carbonate units with groundwater travel velocities ranging from hours to days per mile. Flow in the relatively impermeable Spillville, Maquoketa and Dubuque Formations often occurs as horizontal flow via horizontal fractures and bedding plane conduits (Alexander and Lively, 1995).

Methods

Dye tracing entails using fluorescent dyes to track groundwater flow directions and estimate travel times. The dye is poured into a sinkhole or sinking stream that is receiving natural surface water runoff. From there it flows through the underlying karst conduit system until it re-emerges at a spring, multiple springs, wells or gaining surface water streams. For this project, two fluorescent dyes, eosine and uranine, were used to distinguish between the two input points. The locations of the dye input points and sampling locations are shown in Figure 3 and dye input information is provided in Table 1.

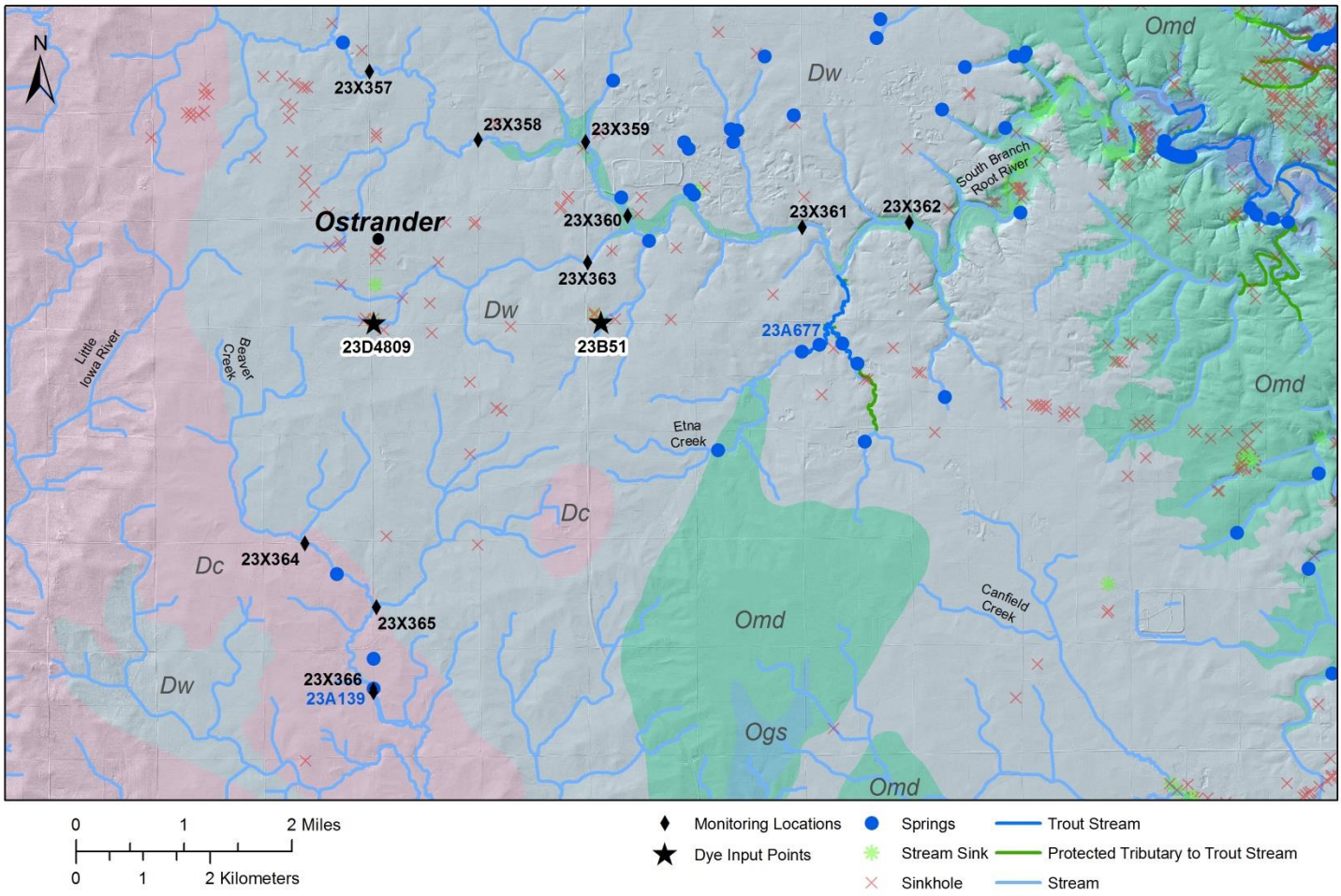

Figure 3. *Dye input locations, sampling locations, local streams, creeks and rivers, and other karst features in the study area. Shading used to delineate bedrock geology loosely corresponds to the shading depicted in figure 2. Geologic unit codes (Maquoketa and Dubuque have been combined into a single map unit Omd) are summarized in Figure 2. Monitoring location and spring labels are shortened versions of the RELATEID field used as a primary key for the Minnesota Groundwater Tracing Database (MGTD), Karst Feature Database (KFD), Minnesota Spring Inventory (MSI) and Minnesota County Well Index (CWI).*

Sampling points consisted of passive charcoal detectors, or “bugs”, that adsorb fluorescent dyes should they flow past the passive detector. Bugs were placed at various local springs and stream locations to determine if the dyes reached the specific points being monitored. In this trace the bugs were changed at intervals ranging from a few hours to a week. After collection, bugs were bathed in an alcohol/-NaOH eluent solution that strips the dye from the charcoal so the solution can be analyzed using a Shimadzu RF5000U scanning spectrofluorophotometer. Each dye is characterized by a unique emission wavelength and can thus be distinguished from other dyes using peak separation techniques. Analyses were performed at the University of Minnesota Earth Sciences Department Hydrochemistry Laboratory.

Table 1. *Ostrander Dye Trace input descriptions (UMN identifier 9305.1 (YYMM.#)). KFD # is a shortened version of the RELATEID field used as a primary key for the Minnesota Groundwater Tracing Database (MGTD), Karst Feature Database (KFD), Minnesota Spring Inventory (MSI) and Minnesota County Well Index (CWI).*

	South Ostrander	Hwys 14/63
Location	T102N/R13W/S29 CCCCCA	T102N/R13W/S27 CCDCCD
UTME (NAD83 zn15)	546109	549495
UTMN (NAD83 zn15)	4827862	4827872
Elevation (ft)	1322	1300
Date	17 May 1993	17 May 1993
Time	15:30	14:20
KFD #	23D4809 (sinkhole)	23B51 (stream sink)
Tracer	Uranine C	Eosine OJ
Batch	Chemcentral Y-882	Chemcentral 3230
Amount (g)	167.2	93.4

Results and Discussion

This dye trace was conducted in May-June 1993 and was one of the first traces conducted using the Shimadzu RF5000U and charcoal detectors. The results presented here are based on a reanalysis of the digital spectral data from the 1993 analyses completed in December of 2017. In retrospect this trace was a critical learning experience. The mistakes made and lessons learned included:

1) The first few charcoal bugs were changed too frequently during the initial stages of the traces. Changing bugs more often than every 1 to 2 days is risky because the activated carbon used in the bugs contains some uranine-like molecular compounds that mimic uranine but seem to wash out after 24 to 48 hours in the water.

2) The initial bugs were installed the same day, shortly before and after the dye injections. Background bugs need to placed, changed, and analyzed before the dye is poured. In this case there appears to have been a fair bit of background fluorescence especially in uranine but also in the eosin and rhodamine spectral ranges.

3) Bugs need to be placed as near to the springs as possible. While it is often easier to put the bugs at road crossings over creeks, this practice leads to bugs with more fluorescent backgrounds which makes for less convincing peaks. This practice also leads to unresolvable ambiguity if more than one spring feeds the creek upstream from the sampling point.

4) Eosin is less fluorescent than uranine. The molecular weight uranine is only 51% that of eosine. A gram of uranine therefore has about twice as many fluorescing molecules as a gram of eosin. We used 56% as much (by weight) eosine as uranine. In this trace less than 1/3 as many eosine molecules were introduced as uranine molecules.

Appendix A summarizes monitoring location results. Peaks with the peak center and full width at half maximum characteristic of uranine were observed at every monitored site and in most of the bugs from each site. Most of these uranine-like peaks were small with peak heights of less than about 10 intensity units. We interpret the results from these bugs to be background uranine and or uranine-like compounds from the activated charcoal bugs.

The bugs from 23X362, the bridge over the South Branch of the Root River (SBRR) at 161st Avenue, yielded uranine peak heights up to 38 intensity units. These positives indicate that the water sinking at 23D4809 resurged somewhere upstream of the 23X362 monitoring location but downstream of 23X361. There are no mapped springs between the monitoring points at 23X361 and 23X362. However, the tributary Etna Creek enters the SBRR between the two monitoring stations. The largest and most likely resurgence spring on Etna Creek is 23A677, Etna Spring. We interpret Etna Spring as the probable resurgence point. That interpretation is shown as a red inferred groundwater flowpath vector in Figure 4. Since no samples were collected at Etna Spring, however, it is also possible that dye resurged in different or additional springs along Etna Creek or at some unknown springs along the SBRR between 23X361 and 23X362.

The positive dye detection in the 23X362 bug, which was removed at 11:05 on 19 May 1993, indicates that the leading edge of the Uranine C dye from 23D4809 reached the SBRR station 23X362 in less than 44.6 hours. Sinkhole 23D4809 is (straight line distance) 8.1 km from 23X362. The combined groundwater/surface water flow speed between the sinkhole and that point in the river was a minimum of 180 m/hr. The actual speed was likely greater than 180m/hr because the actual path of the dye was likely more tortuous than a straight line.

The eosin injected in streamsink 23B51 (the Hwys14/63 trace) was not clearly detected at a significant concentration at any of the sampling locations. This result can occur for a number of different reasons: 1) the dye took longer than the sampling period to reach the sampled springs or surface water locations, 2) the flow went to another, unmonitored spring, 3) the dye was diluted to below the detection limit before it reached the monitored springs. Sporadic small peaks at eosin's spectral location were observed in several bugs. Eosin was detected in the 20-21 May and 21-26 May bugs at 23X357. These eosin detects could not, however, have been the eosin introduced at stream sink 23B51 because the monitoring station is at a higher elevation than the dye input point. The 23X357 results are a seemingly clear indication that a background of eosin was present in the study area. A trace of eosin was observed at 23X358 in the 20-21 May bug and at 23X359 in the 21-26 May bug further downstream. Eosin was detected further downstream at 23X360 in the 21-26 May bug but was not detected at the next monitoring station 23X361 downstream on the SBRR. Eosin was detected in the 21-26 May and 26 May -2 June bugs at 23X362, which is where the dye trace uranine is interpreted to have been detected. Finally, the strongest eosin detection during the monitoring period was from the 2-9 Jun bug collected from 23X363, which is far back upstream in the system along U.S. Hwy 63 north of the eosin input point. None of these results are a convincing indication that Eosin from 23B51 resurfaced anywhere in the study area during the monitored interval.

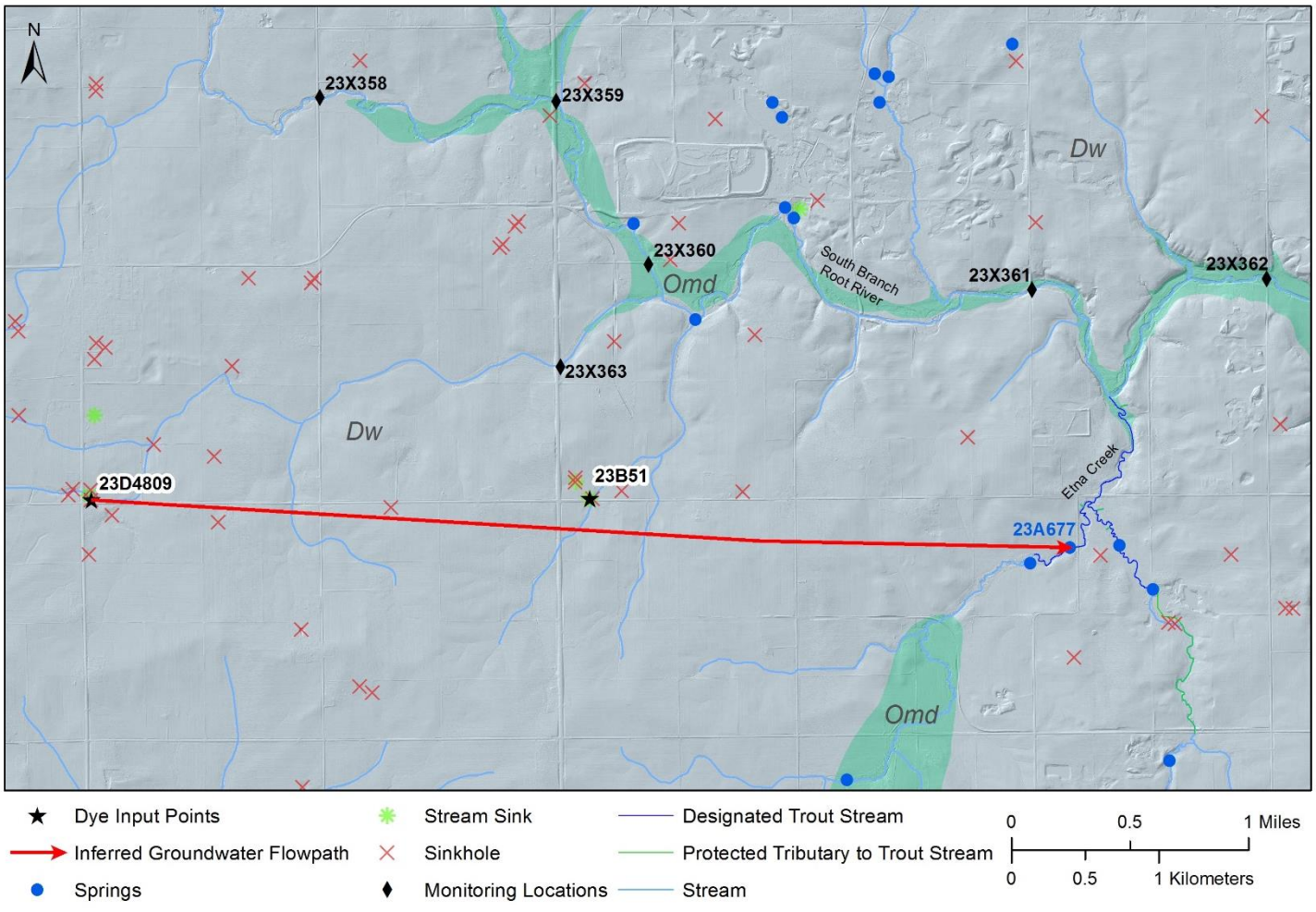

Figure 4. *Inferred Groundwater Flow Vector for the Ostrander South trace. Shading used to delineate bedrock geology loosely corresponds to the shading depicted in figure 2. Geologic unit codes (Maquoketa and Dubuque have been combined into a single map unit Omd) are summarized in Figure 2. Labels are shortened versions of the RELATEID field used as a primary key for the Minnesota Groundwater Tracing Database (MGTD), Karst Feature Database (KFD), Minnesota Spring Inventory (MSI) and Minnesota County Well Index (CWI).*

Conclusions

Due to a lack of data in the vicinity of the study area, no springsheds were delineated as a result of these two traces. This study did, however, provide an important learning experience that helped to set the stage for many later groundwater traces in southeast Minnesota.

Acknowledgements

The authors would like to graciously thank the landowners who allowed access to their properties during dye pouring and subsequent sampling. This work was funded by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative Citizen Commission on Minnesota Resources (LCCMR; formerly LCMR).

References

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Runkel, A.C., Steenberg, J.R., Tipping, R.G., Retzler, A.J. (2013). Physical hydrogeology of the groundwater-surface water system of southeastern Minnesota and geologic controls on nitrate transport and stream baseflow concentrations: Minnesota Geological Survey report delivered to the Minnesota Pollution Control Agency, Contract number B50858 (PRJ07522).

Appendix A

Summary of Fluorescent Spectra from the 17 Sep 1973 Ostrander Dye Trace (9305.1)

Notes:

- All dates are from 1993
- This data is from a reanalysis (Dec 2017) of digital spectral data collected in 1993 with a Shimadzu RF5000U Scanning Spectrofluorophotometer.
- The units for Pk (Peak) Center and FWHM (Full Width @ Half Maximum) are nanometers. The Pk Height and sigma are in arbitrary intensity units.
- Color codes are applied to data that match the dye's (analyzed standards) Pk Center value, FWHM value, and have peak heights more than ~10 times the one sigma scatter of the fits to the spectra.
- The color codes are green for peaks in the Uranine region, brown for peaks in the Eosin region and red for peaks in the Rhodamine WT region.
- In the "Interpretation" column, interpretations **preceded by a +, in bold, and in ALL CAPS** are those that we believe that the bug contained the dye used in this trace and not any background compounds.

23X357: SBRR @ HWY 1

UTME: 546040 UTMN:4831610 Elevation: 1303ft

Charcoal Detectors - "Bugs"				**Fluorescein Region of Spectra**					**Eosin or Rhodamine WT Regions of Spectra**					**Interpretation**
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	13:00	17-May	21:55	515.2	2.4	51.0	19.3	38.5						background fluorescein
17-May	21:55	18-May	16:15	515.2	1.4	28.6	18.4	26.5						background fluorescein
18-May	16:15	19-May	11:45	512.4	0.5	12.3	24.8	6.7						
19-May	11:45	20-May	18:35	514.8	1.6	33.6	19.3	23.4						background fluorescein
20-May	18:35	21-May	14:30	515.3	5.7	128.5	20.7	91.6	540.5	1.2	26.0	19.8	19.4	background fluorescein and eosin
21-May	14:30	26-May	12:00	514.6	4.3	132.8	28.6	41.8	545.4	1.4	34.6	22.3	14.0	background fluorescein and eosin
26-May	12:00	Lost												
2-Jun	12:00	9-Jun	16:20	507.0	16.8	1267.0	69.5							

23X358: SBRR @ 121st Ave

UTME: 547662 UTMN: 4830593 Elevation: 1289 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	13:10	17-May	21:50	514.8	6.5	142.6	20.1	91.5						background fluorescein
17-May	21:50	18-May	16:20	514.9	3.0	59.7	18.1	41.0	569.4	0.2	2.9	14.2	2.4	background fluorescein with rhodamine (antifreeze)
18-May	16:20	19-May	11:40	514.4	3.8	79.1	19.0	44.7	571.7	0.5	9.2	18.0	5.5	background fluorescein with rhodamine (antifreeze)
19-May	11:40	20-May	18:30	514.0	1.2	23.8	18.4	19.0	572.0	0.2	6.3	24.7	3.9	background fluorescein with rhodamine (antifreeze)
20-May	18:30	21-May	14:45	515.2	1.8	36.6	19.0	35.2	540.4	0.2	2.6	13.5	3.4	background fluorescein and eosin
21-May	14:45	Lost												
26-May	12:00	2-Jun	17:05	506.7	6.1	379.9	57.2							
2-Jun	17:05	9-Jun	16:30	504.2	15.3	1182.0	70.9							

23X359: SBRR @ US 63

UTME: 549267 UTMN: 4830565 Elevation: 1283 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Area	FWHM	PH/ sigma	Pk Center	Pk Height	Area	FWHM	PH/ sigma	
17-May	13:20	17-May	21:45	514.8	0.7	13.9	17.6	13.2						background fluorescein
17-May	21:45	18-May	16:30	515.1	5.9	122.3	19.2	105.1						background fluorescein
18-May	16:30	19-May	11:25	515.3	10.2	219.3	19.8	141.0						background fluorescein
19-May	11:25	20-May	18:20	514.1	1.6	43.8	25.4	20.4						background fluorescein
20-May	18:20	21-May	18:00	515.5	2.2	46.5	19.8	39.8						background fluorescein
21-May	18:00	26-May	12:00	515.0	3.9	83.2	19.7	63.8	541.6	0.3	5.8	18.7	4.6	background fluorescein and eosin
26-May	12:00	2-Jun	17:00	510.3	3.6	155.3	39.6	49.4						
2-Jun	17:00	9-Jun	16:35	507.1	8.0	464.1	53.4	33.2						

23X360: SBRR @ 180th St

UTME: 549894 UTMN: 4829459 Elevation: 1273 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	13:30	17-May	21:30	515.3	2.4	49.5	19.0	45.7						background fluorescein
17-May	21:30	18-May	16:40	514.8	3.1	64.4	19.1	41.8						background fluorescein
18-May	16:40	19-May	11:30	514.8	4.7	103.4	21.2	74.5	567.3	0.4	6.4	16.5	5.7	background fluorescein with rhodamine (antifreeze)
19-May	11:30	20-May	18:10	515.3	4.7	97.9	19.2	82.1						background fluorescein
20-May	18:10	21-May	15:15	514.9	4.7	102.9	20.3	63.6						background fluorescein
21-May	15:15	26-May	12:00	515.2	4.4	95.9	19.9	61.6	540.9	0.7	15.2	20.2	9.7	backgroundfluorescein and eosin
26-May	12:00	2-Jun	16:55	514.3	3.7	77.5	19.2	36.6						background fluorescein
2-Jun	16:55	9-Jun	16:45	516.5	4.2	79.9	17.4	28.0						

23X361: SBRR @ 151st Ave

UTME: 549894 UTMN: 4829459 Elevation: 1254 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	21:55	18-May	16:50	515.2	9.0	183.0	18.7	109.9						background fluorescein
18-May	16:50	19-May	11:15	514.6	0.6	10.2	14.9	6.4						
19-May	11:15	20-May	18:10	514.9	1.5	29.2	17.5	23.4	566.1	0.7	17.5	24.7	10.1	background fluorescein with rhodamine (antifreeze)
20-May	18:10	21-May	16:10	514.7	1.0	20.4	19.7	14.1	564.9	3.0	73.2	22.8	44.4	background fluorescein with rhodamine (antifreeze)
21-May	16:10	26-May	12:00	513.4	0.9	20.8	20.8	14.4						background fluorescein
26-May	12:00	2-Jun	16:40	506.7	17.1	1529.0	80.2	211.0						
2-Jun	16:40	9-Jun	16:55	502.6	33.8	3520.0	93.5	269.3						

23X362: SBRR @ 161st Ave

UTME: 549894 UTMN: 4829459 Elevation: 1242 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	14:15	17-May	21:10	514.5	15.7	370.4	21.7	169.9						background fluorescein
17-May	21:10	18-May	17:00	513.7	6.0	137.0	21.3	68.9						background fluorescein
18-May	17:00	19-May	11:05	515.1	19.3	415.6	19.8	197.6						**+POSITIVE FLUORESCEIN**
19-May	11:05	20-May	17:50	514.9	16.0	344.8	19.8	220.8						**+POSITIVE FLUORESCEIN**
20-May	17:50	21-May	16:20	514.9	24.0	525.0	20.1	319.9						**+POSITIVE FLUORESCEIN**
21-May	16:20	26-May	16:23	514.8	38.3	828.0	19.9	483.0	540.5	0.6	7.7	11.8	7.6	**+POSITIVE FLUORESCEIN** unquantifable eosin
26-May	16:23	2-Jun	16:20	515.2	10.4	218.0	19.3	127.8	541.5	0.4	4.1	9.5	4.9	**+POSITIVE FLUORESCEIN** unquantifable eosin
2-Jun	16:20	lost												

23X363: US 63 Mile Post 8

UTME: 549299 UTMN: 4828765 Elevation: 1289 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	13:25	17-May	21:20	515.2	1.4	28.5	18.4	24.4						
17-May	21:20	18-May	16:45	513.0	2.3	64.0	25.2	28.9	567.4	0.5	12.2	21.8	6.4	background fluorescein with rhodamine (antifreeze)
18-May	16:45	19-May	11:35	513.3	6.6	178.0	25.0	64.1	567.9	1.7	44.5	24.6	16.5	background fluorescein with rhodamine (antifreeze)
19-May	11:35	20-May	18:10	510.6	1.2	11.3	13.9	17.2						
20-May	18:10	21-May	15:00	515.2	2.8	61.8	20.2	43.5	541.5	0.2	4.0	15.8	3.7	background fluorescein and eosin
21-May	15:00	26-May	12:00	515.1	1.8	37.5	19.5	32.4	541.0	0.3	5.0	15.8	5.2	background fluorescein and eosin
26-May	12:00	2-Jun	16:50	508.7	0.7	26.2	33.0	7.3						
2-Jun	16:50	9-Jun	16:50	513.3	1.5	55.1	33.9	16.7	543.0	3.2	53.5	15.5	35.7	background fluorescein and eosin

23X364: North Beaver Creek

UTME: 545077 UTMN: 4824575 Elevation: 1302 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	14:50	17-May	21:15	514.0	0.9	19.1	20.0	15.2						background fluorescein
17-May	21:15	18-May	16:15	515.0	1.0	21.1	18.6	18.9						background fluorescein
18-May	16:15	19-May	11:55	513.7	0.9	20.3	21.1	15.0						background fluorescein
19-May	11:55	20-May	18:45	514.2	2.2	53.0	21.7	34.4						background fluorescein
20-May	18:45	21-May	15:30	514.2	1.7	41.0	21.8	27.6						background fluorescein
21-May	15:30	26-May	12:00	515.0	1.9	40.0	18.9	36.8						background fluorescein
26-May	12:00	2-Jun	16:20	514.8	1.4	27.9	19.0	12.4						background fluorescein
2-Jun	16:20	lost												

23X365: Middle Beaver Creek

UTME: 546143 UTMN: 4823623 Elevation: 1282 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	15:45	17-May	22:20	513.6	0.5	11.5	19.9	8.2						
17-May	22:20	18-May	16:00	512.0	0.6	22.9	33.2	9.7	566.8	0.4	12.3	26.0	6.5	background fluorescein with rhodamine (antifreeze)
18-May	16:00	19-May	12:00	514.6	2.4	53.9	20.6	37.9	571.4	0.2	3.6	21.9	3.2	background fluorescein with rhodamine (antifreeze)
19-May	12:00	20-May	18:50	513.2	0.9	21.7	21.3	13.1	567.6	0.2	4.9	20.9	2.9	background fluorescein with rhodamine (antifreeze)
20-May	18:50	21-May	15:30	514.6	0.6	13.4	19.4	10.4						background fluorescein
21-May	15:30	26-May	12:00	514.8	1.1	22.1	18.9	17.5						background fluorescein
26-May	Lost													
2-Jun	Lost													

23X366: South Beaver Creek

UTME: 546087 UTMN: 4822356 Elevation: 1267 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	Pk Center	Pk Height	Pk Area	FWHM	PH/ sigma	
17-May	13:55	17-May	22:25	514.4	0.9	25.5	17.8	16.8						
17-May	22:25	18-May	15:55	513.3	1.9	48.1	23.4	27.3	570.1	0.9	25.5	25.9	12.9	background fluorescein with rhodamine (antifreeze)
18-May	15:55	19-May	12:05	514.7	4.4	100.2	20.9	57.7	570.7	0.8	22.9	27.3	10.5	background fluorescein with rhodamine (antifreeze)
19-May	12:05	20-May	18:55	513.7	1.9	51.4	25.1	26.5						background fluorescein
20-May	18:55	21-May	15:50	515.1	3.7	78.9	19.7	64.4						background fluorescein
21-May	15:50	26-May	12:00	513.5	1.3	29.3	20.6	19.0						background fluorescein
26-May	12:00	2-Jun	16:05	498.6	25.6	2600.0	93.6	286.5						
2-Jun	16:05	9-Jun	17:25	505.3	27.2	2130.0	71.8	247.7						

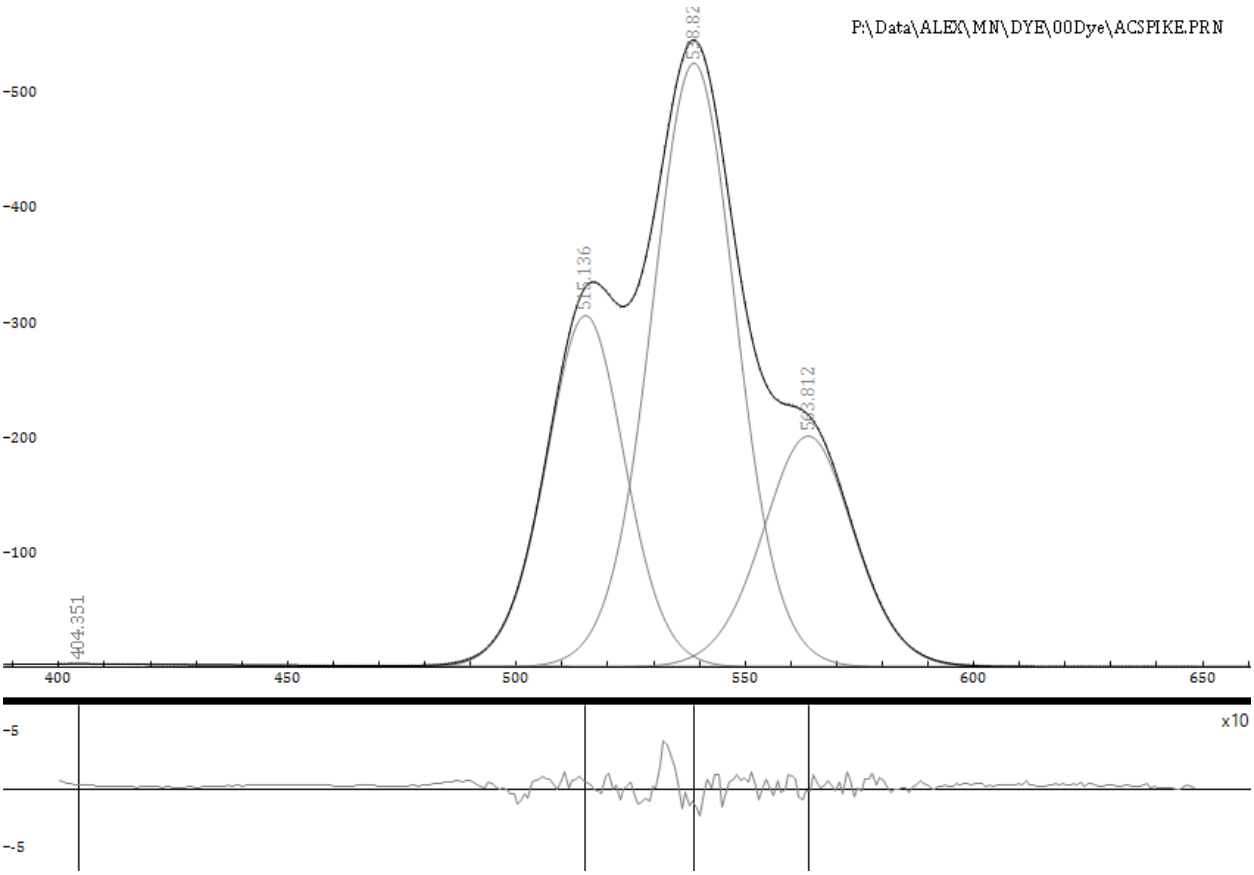
23A139: Benson Spring

UTME: 546101 UTMN: 4822413 Elevation: 1275 ft

Charcoal Detectors - "Bugs"				Fluorescein Region of Spectra					Eosin or Rhodamine WT Regions of Spectra					Interpretation
Date Time IN		Date Time OUT		Pk Center	Pk Height	Area	FWHM	PH/ sigma	Pk Center	Pk Height	Area	FWHM	PH/ sigma	
17-May	14:00	17-May	22:25	514.7	1.8	36.6	18.4	26.0						
17-May	22:25	18-May	15:55	514.5	1.4	28.2	19.1	20.3	576.2	1.0	26.2	22.7	14.5	background fluorescein with rhodamine (antifreeze)
18-May	15:55	19-May	12:05	513.9	3.6	87.8	22.1	46.0	570.1	1.0	25.0	23.8	12.3	background fluorescein with rhodamine (antifreeze)
19-May	12:05	20-May	18:55	514.6	3.3	74.4	20.8	53.4						background fluorescein
20-May	18:55	21-May	15:45	514.9	2.5	51.7	19.4	45.2						background fluorescein
21-May	15:45	26-May	12:00	514.3	1.0	19.7	18.9	17.2						background fluorescein
26-May	12:00	2-Jun	16:05	510.0	3.7	171.6	42.9	40.0						
2-Jun	16:05	9-Jun	16:00	509.2	6.9	329.2	44.1	60.6						

Appendix B

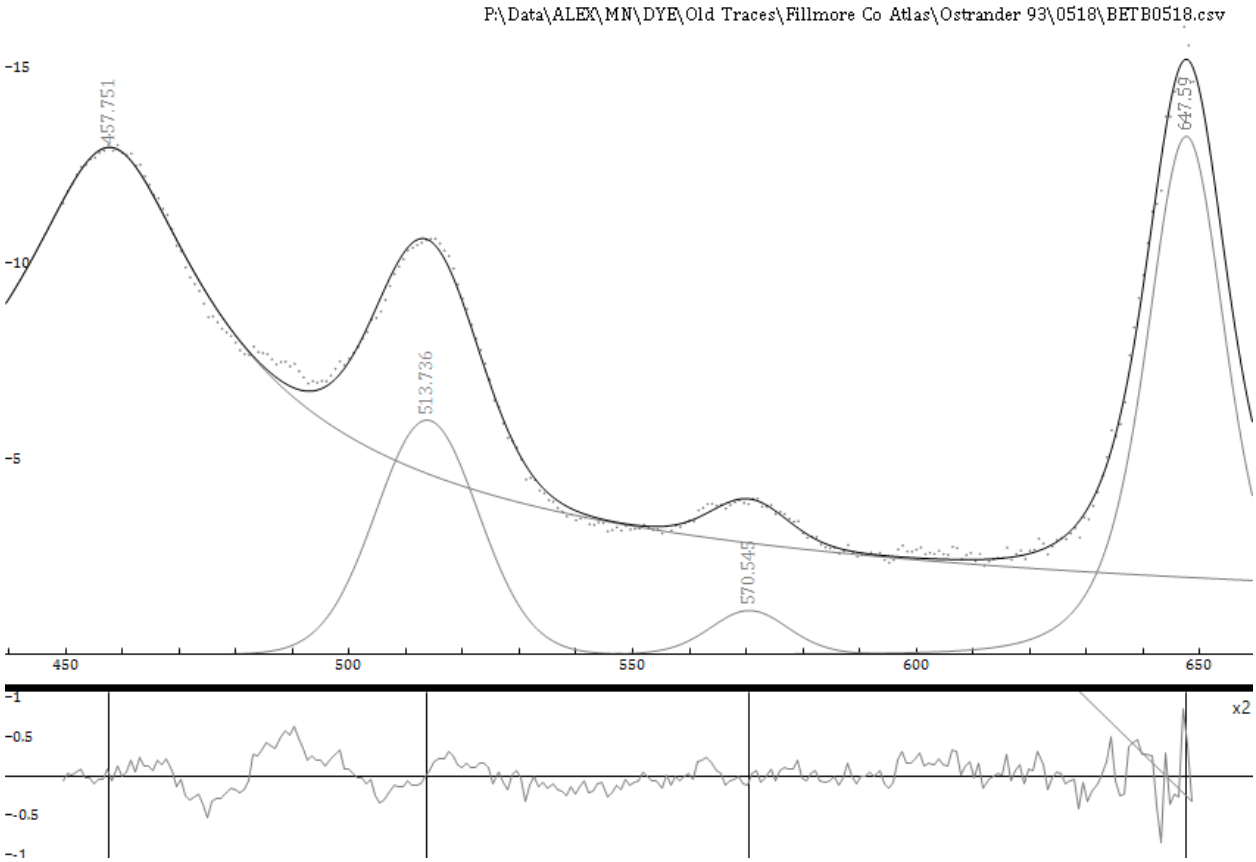
December 2017 spectral analyses of the 1993 analyses of Charcoal Detectors from the 17 May 1993 Ostrander Dye Trace.



Activated Carbon Spiked with Uranine, Eosin and Rhodamine WT

=-> info fit
WSSR=7.2345 DoF=302 WSSR/DoF=0.0239553 SSR=129.371 R2=0.999982
=-> info peaks

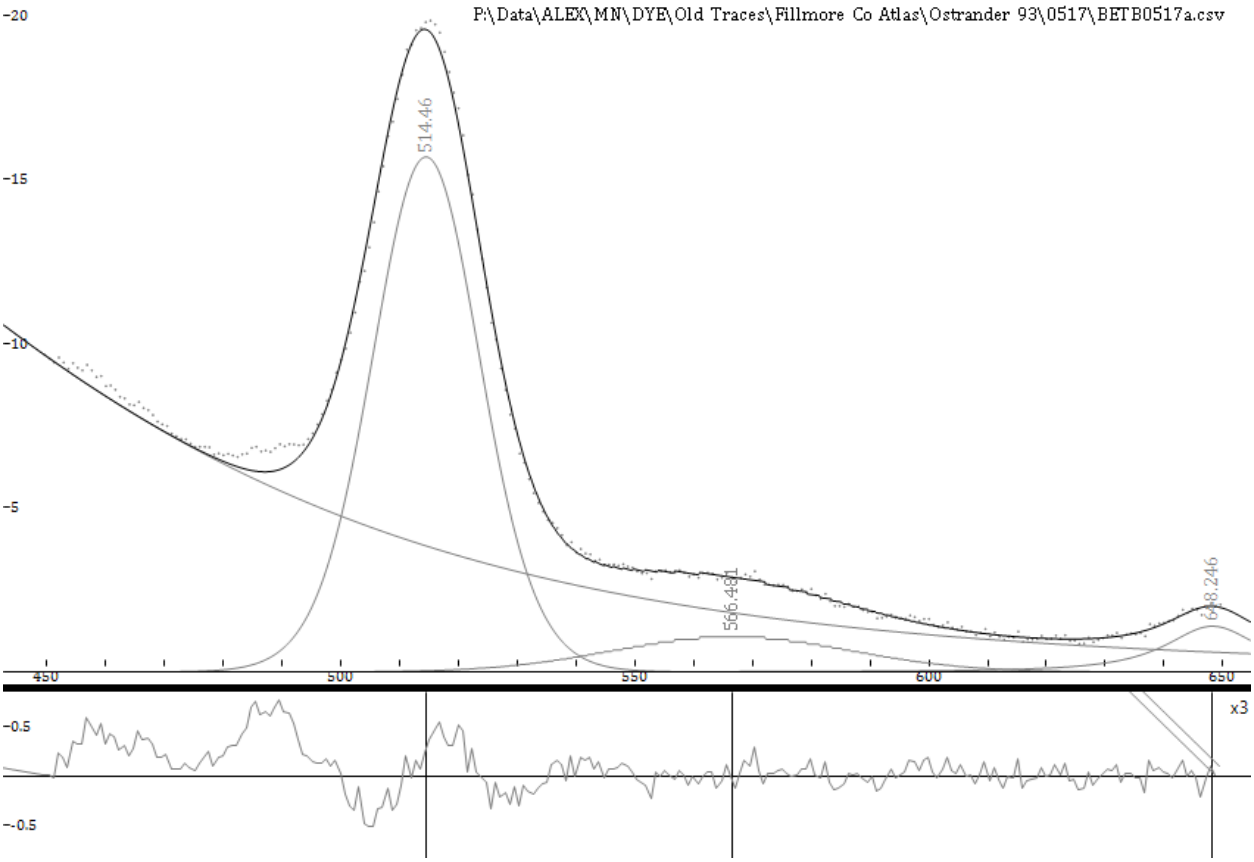
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	404.351	2.88724	x	114.333	2.88724 404.351 57.1667 0.35692
%_3 Pearson7	515.136	305.728	6546.39	19.6903	305.728 515.136 9.84517 10
%_4 Pearson7	563.812	201.007	4952.78	22.6582	201.007 563.812 11.3291 10
%_5 Pearson7	538.824	525.251	12046.6	21.0905	525.251 538.824 10.5452 10



S Branch Root River below Etna Creek at 161st Ave 930518

=-> info fit
WSSR=1.78788 DoF=236 WSSR/DoF=0.00757577 SSR=11.0675 R2=0.996703
=-> info peaks

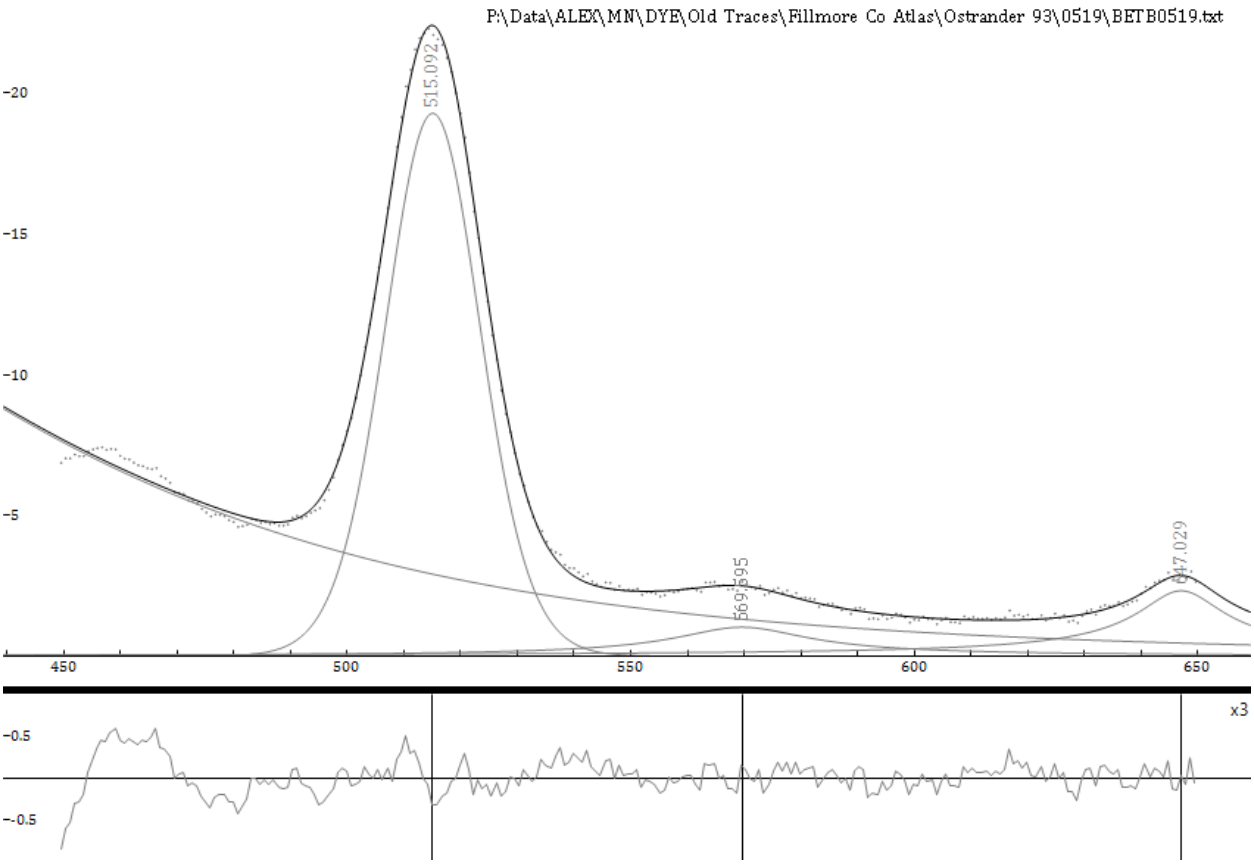
# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	647.59	13.2299	266.276	16.7981	13.2299 647.59 8.39906 2.23351
%_2 Pearson7	457.751	12.9472	x	66.4391	12.9472 457.751 33.2196 0.35692
%_3 Pearson7	513.736	5.98126	137.013	21.3471	5.98126 513.736 10.6735 25.6033
%_4 Pearson7	570.545	1.11826	19.678	16.1817	1.11826 570.545 8.09084 10



S Branch Root River below Etna Creek at 161st Ave 930517

=-> info fit
WSSR=2.04954 DoF=240 WSSR/DoF=0.00853974 SSR=13.2259 R2=0.997765
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	566.481	1.06717	x	47.7825	1.06717 566.481 -23.8912 -6.99456e+014
%_2 Pearson7	343.735	21.8111	4957.59	192.763	21.8111 343.735 96.3814 2.50436
%_3 Pearson7	514.46	15.6906	370.419	21.7091	15.6906 514.46 10.8545 10
%_5 Pearson7	648.246	1.395	37.6765	18.9773	1.395 648.246 9.48863 1.18875

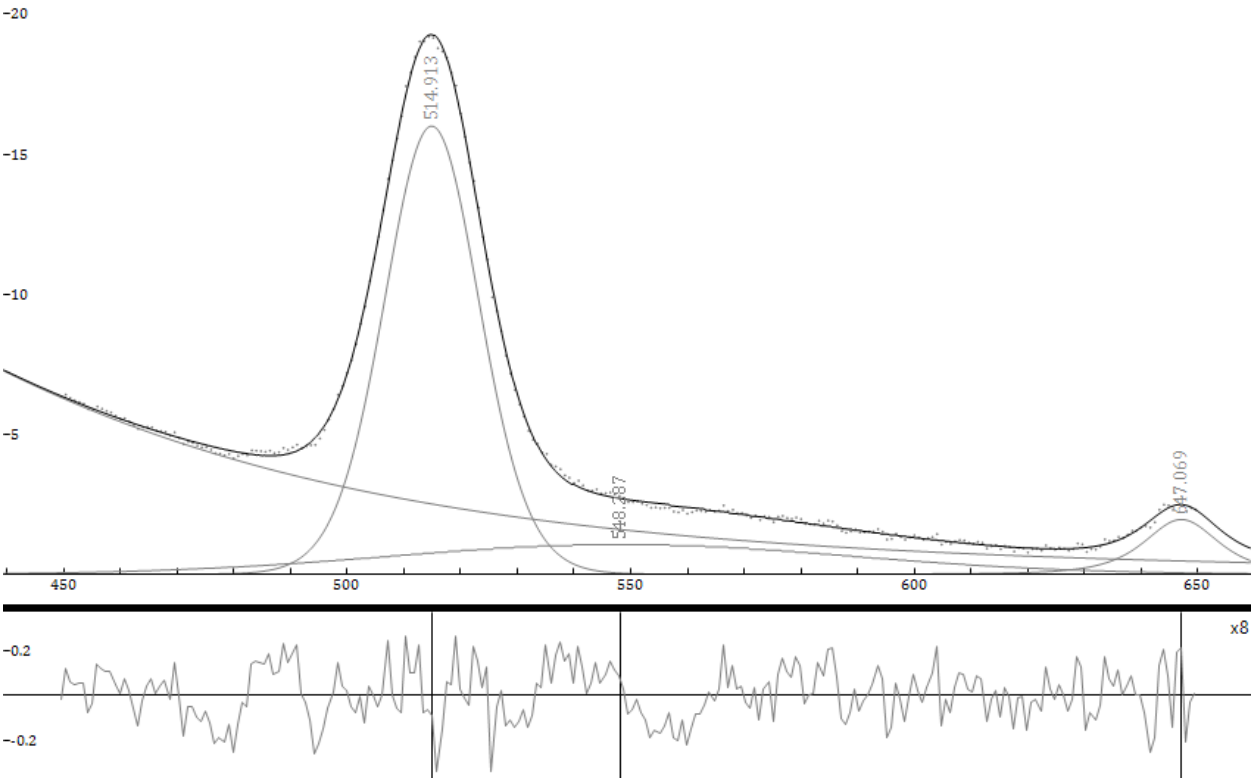


S Branch Root River below Etna Creek at 161st Ave 930519

=-> info fit
WSSR=2.26633 DoF=238 WSSR/DoF=0.0095224 SSR=9.94006 R2=0.998512
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	569.595	1.03364	77.8762	32.1584	1.03364 569.595 16.0792 0.709905
%_2 Pearson7	326.644	21.8111	4935.14	192.763	21.8111 326.644 96.3814 2.59716
%_3 Pearson7	515.092	19.2858	415.566	19.8148	19.2858 515.092 9.90741 10
%_5 Pearson7	647.029	2.3278	221.274	22.8812	2.3278 647.029 11.4406 0.590108

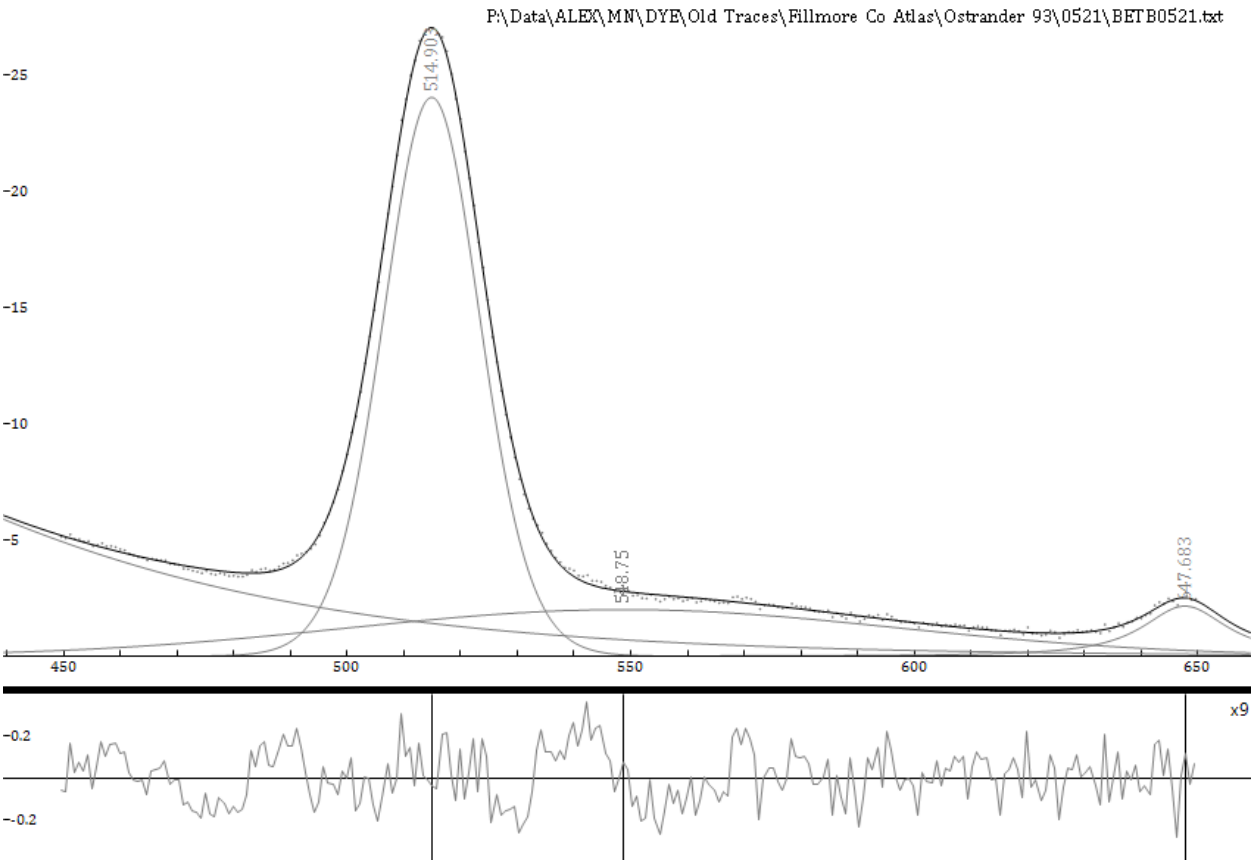
P:\Data\ALEX\MN\DYE\Old Traces\Fillmore Co Atlas\Ostrander 93\0520\BETB0520.txt



S Branch Root River below Etna Creek at 161st Ave 930520

=-> info fit
WSSR=1.25166 DoF=238 WSSR/DoF=0.00525908 SSR=3.55948 R2=0.999284
=-> info peaks

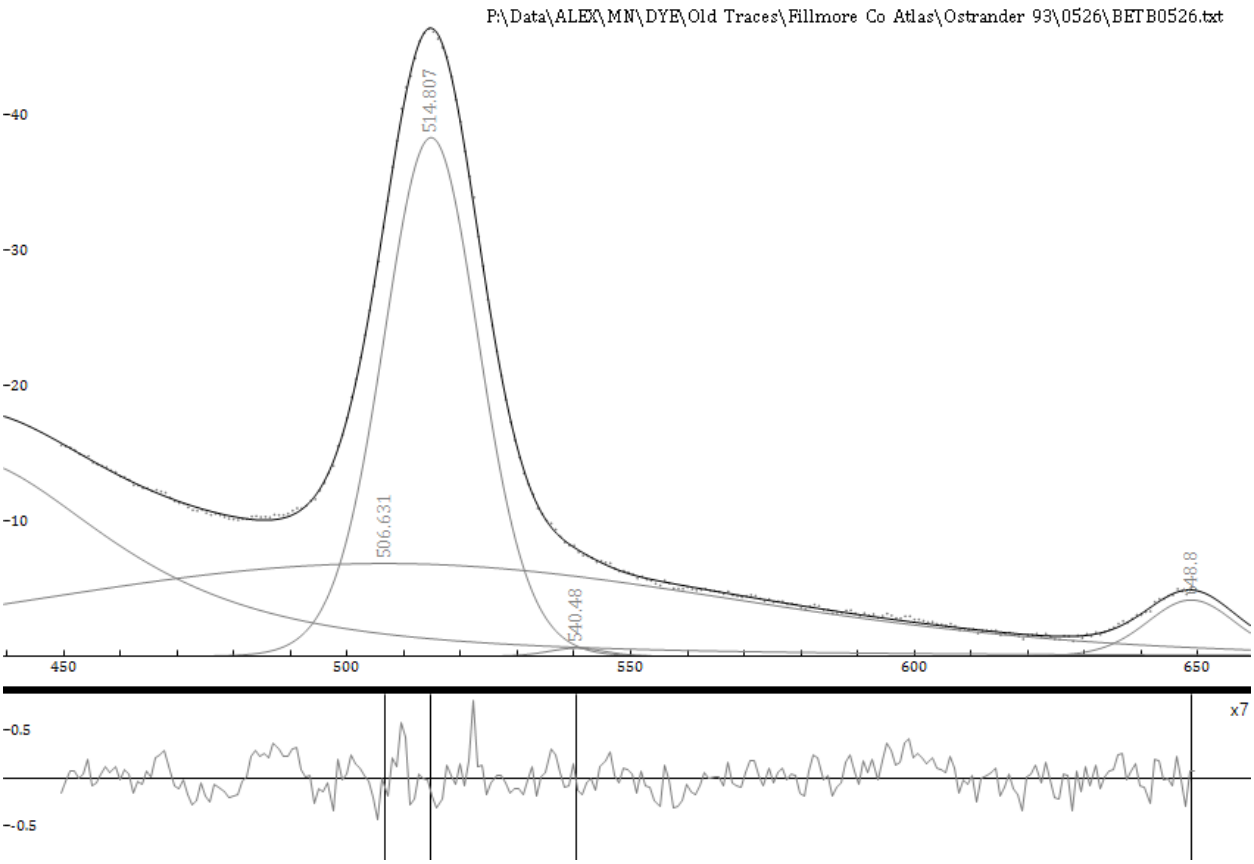
# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	548.287	1.06371	27.4895	96.1496	1.06371 548.287 48.0748 1.97088e+014
%_2 Pearson7	312.301	21.8111	5010.65	192.763	21.8111 312.301 96.3814 2.31562
%_3 Pearson7	514.913	16.0049	344.772	19.8091	16.0049 514.913 9.90456 10
%_5 Pearson7	647.069	1.95744	37.7667	15.4974	1.95744 647.069 7.74868 1.8067



S Branch Root River below Etna Creek at 161st Ave 930521

=-> info fit
WSSR=1.33762 DoF=238 WSSR/DoF=0.00562024 SSR=3.83954 R2=0.999617
=-> info peaks

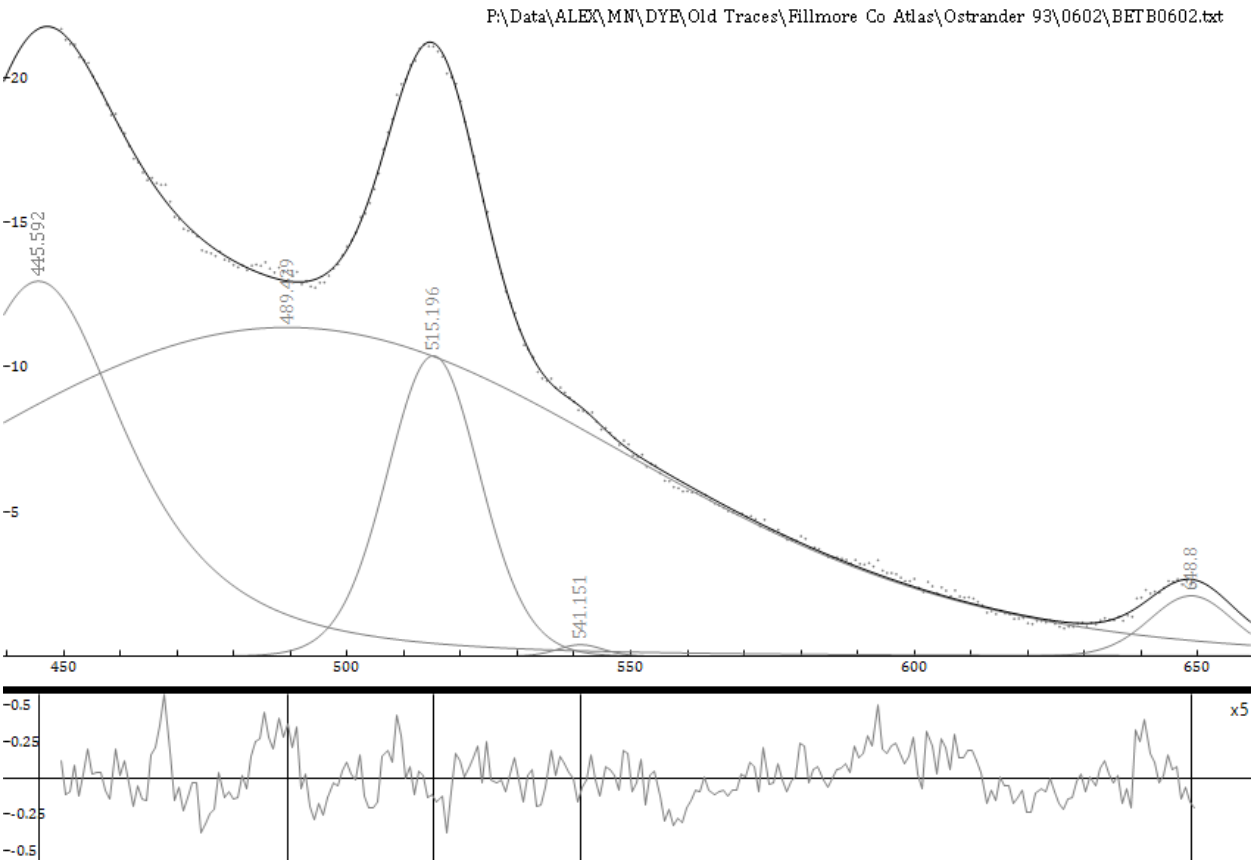
# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	548.75	2.00412	231.638	114.766	2.00412 548.75 57.3832 2.47959e+013
%_2 Pearson7	302.923	21.8111	4671.04	192.763	21.8111 302.923 96.3814 5.26687
%_3 Pearson7	514.903	24.0091	525.053	20.1101	24.0091 514.903 10.0551 10
%_5 Pearson7	647.683	2.15836	55.3638	17.783	2.15836 647.683 8.89149 1.15611



S Branch Root River below Etna Creek at 161st Ave 930526

=-> info fit
WSSR=1.49258 DoF=237 WSSR/DoF=0.0062978 SSR=7.63848 R2=0.999746
=-> info peaks

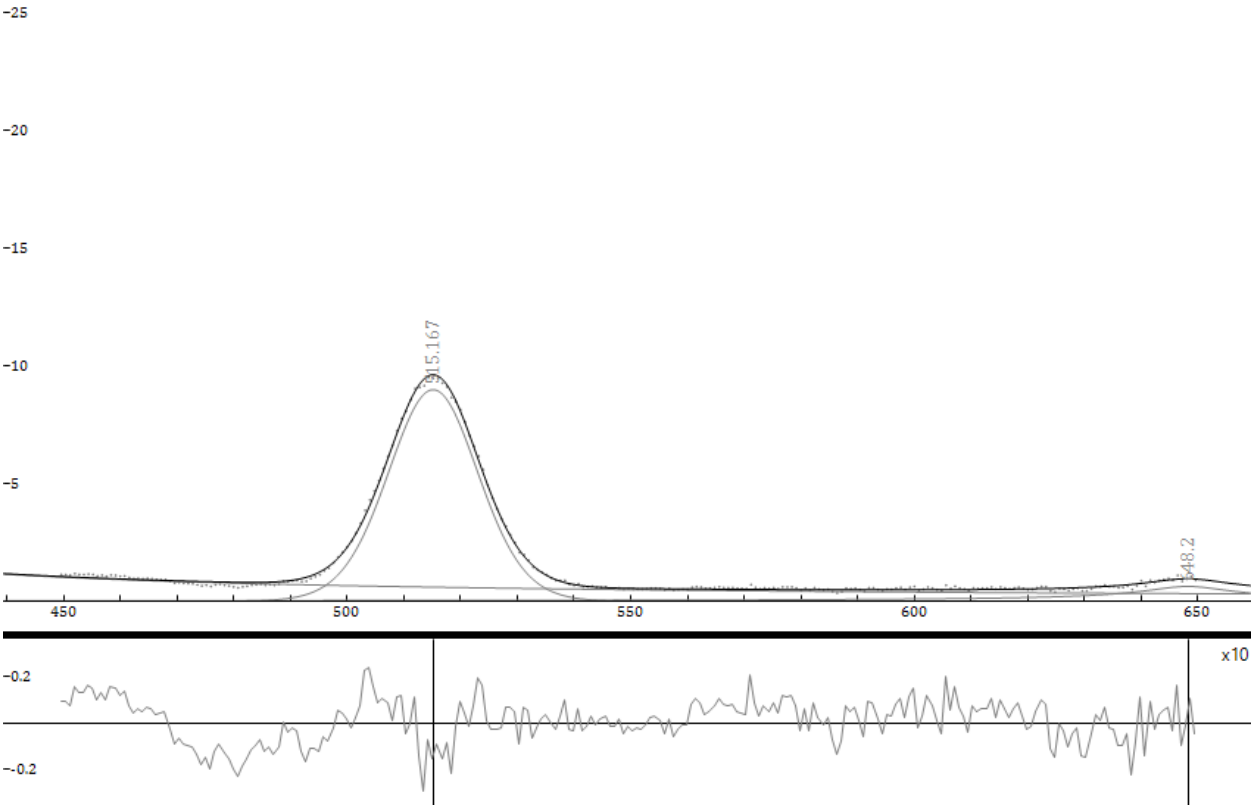
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	431.116	14.7334	1224.47	63.696	14.7334 431.116 31.848 1.5
%_3 Pearson7	514.807	38.3097	827.7	19.8679	38.3097 514.807 9.93394 10
%_10 Pearson7	648.8	4.15897	83.1755	18.3906	4.15897 648.8 9.19532 10
%_11 Pearson7	506.631	6.85312	1100.73	147.699	6.85312 506.631 73.8495 10
%_13 Pearson7	540.48	0.600314	7.69789	11.7918	0.600314 540.48 5.8959 10



S Branch Root River below Etna Creek at 161st Ave 930602

=-> info fit
WSSR=1.57272 DoF=237 WSSR/DoF=0.00663595 SSR=7.11068 R2=0.999349
=-> info peaks

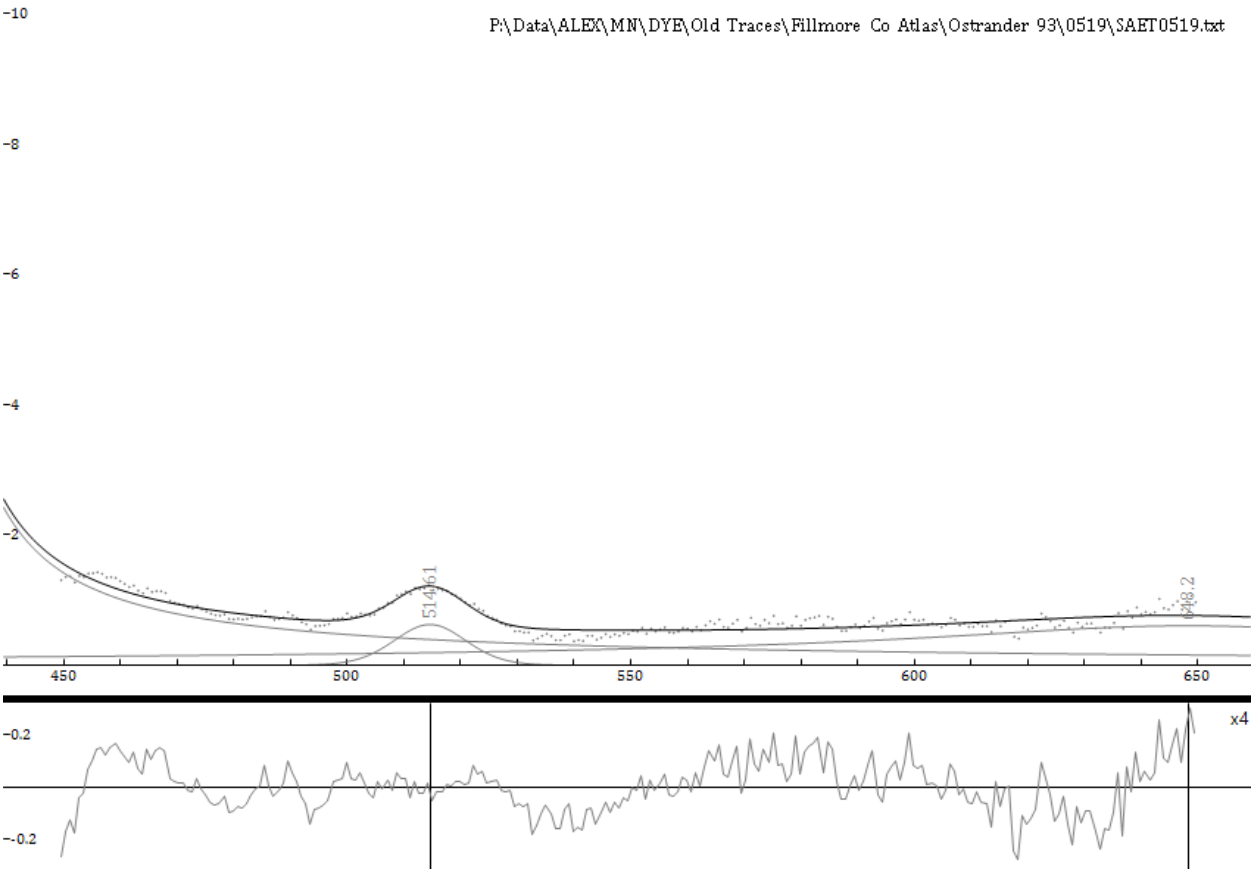
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	445.592	12.9603	622.52	36.8135	12.9603 445.592 18.4068 1.5
%_3 Pearson7	515.196	10.3837	218.002	19.3061	10.3837 515.196 9.65304 10
%_10 Pearson7	648.8	2.09149	39.6995	17.4548	2.09149 648.8 8.72742 10
%_11 Pearson7	489.429	11.3654	1773.03	143.456	11.3654 489.429 71.7279 10
%_13 Pearson7	541.151	0.400956	4.14487	9.50607	0.400956 541.151 4.75303 10



S Branch Root River above Etna Creek at 151st Ave 930518

=-> info fit
WSSR=1.63475 DoF=243 WSSR/DoF=0.00672736 SSR=2.09842 R2=0.998273
=-> info peaks

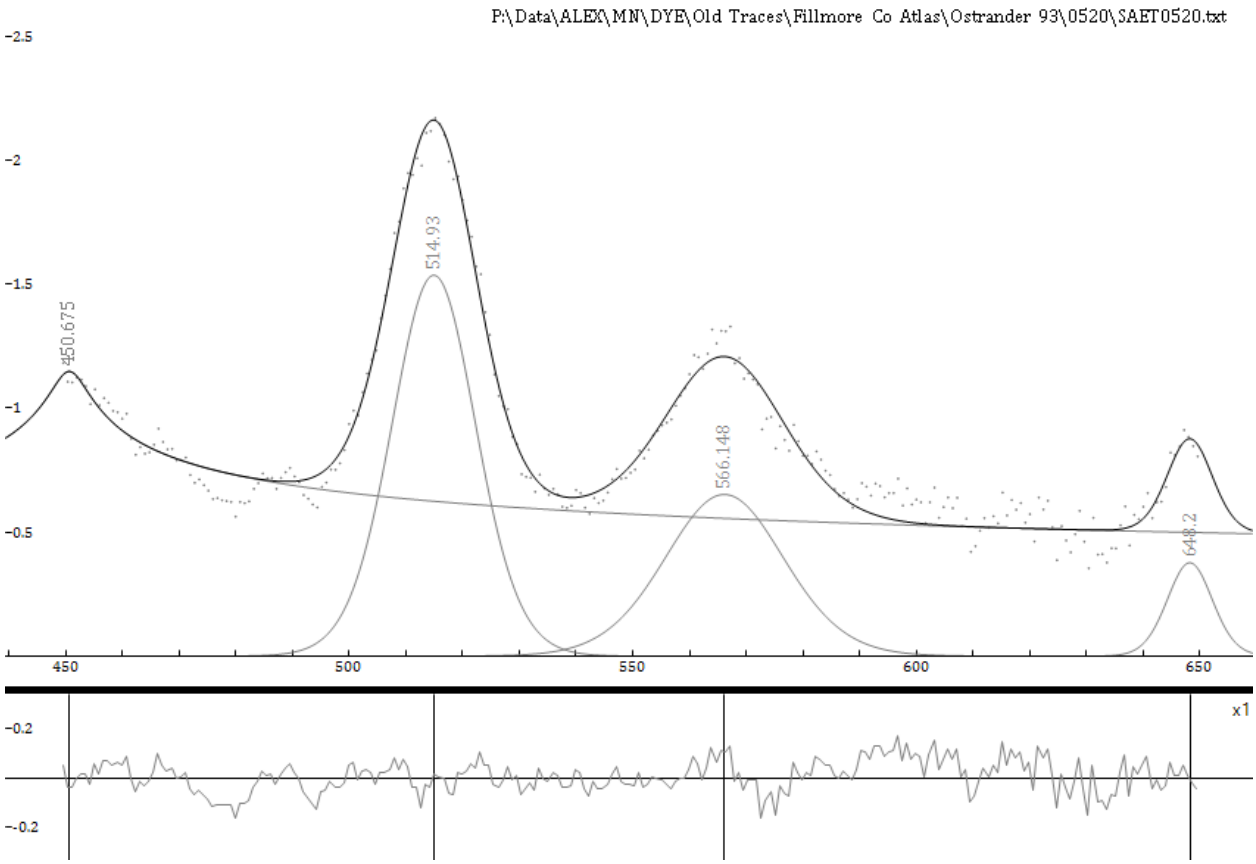
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	357.788	11.2487	x	29.2407	11.2487 357.788 14.6203 0.5
%_3 Pearson7	515.167	8.99642	183.026	18.7081	8.99642 515.167 9.35405 10
%_5 Pearson7	648.2	0.633162	x	26.0306	0.633162 648.2 13.0153 0.5



S Branch Root River above Etna Creek at 151st Ave 930519

=-> info fit
WSSR=2.37486 DoF=243 WSSR/DoF=0.00977307 SSR=2.47627 R2=0.838145
=-> info peaks

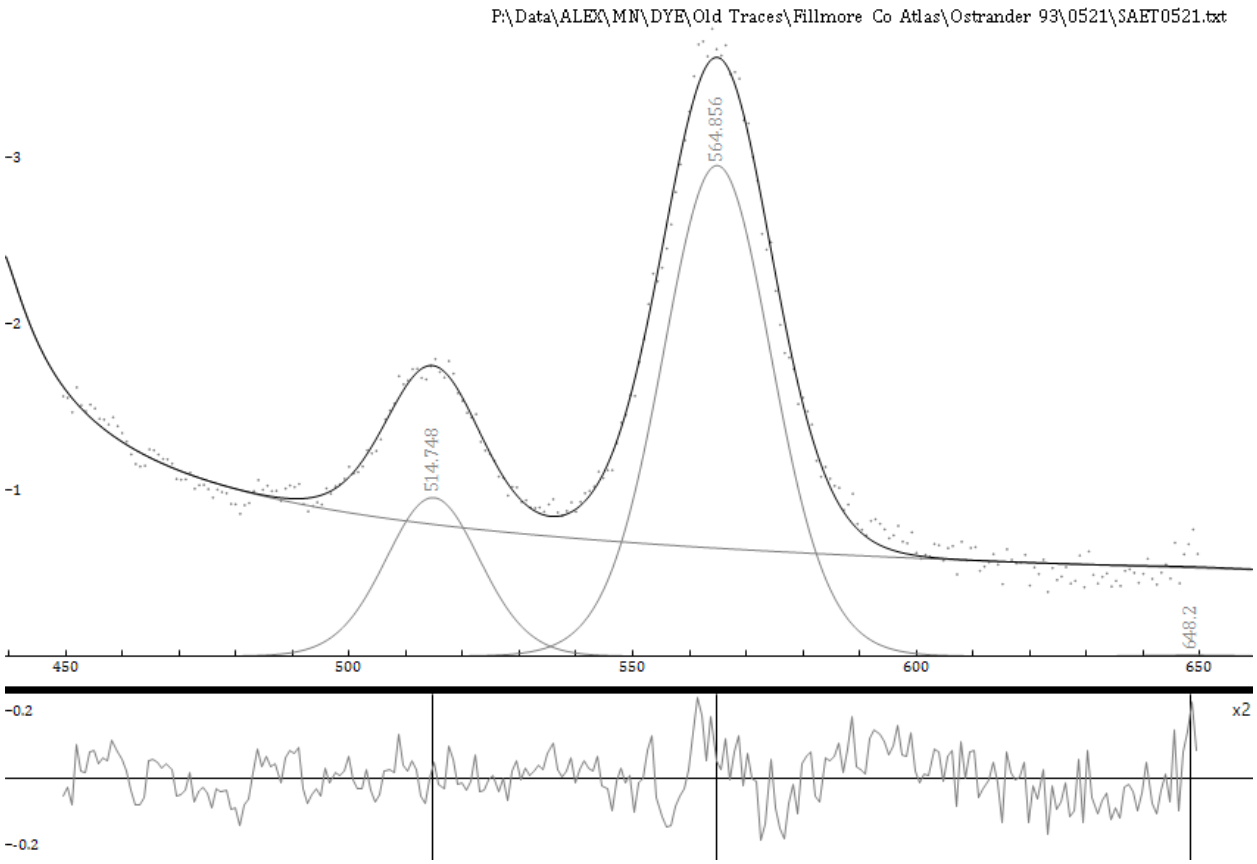
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	425.517	8.29505	x	14.7499	8.29505 425.517 7.37494 0.5
%_3 Pearson7	514.61	0.626501	10.1823	14.9455	0.626501 514.61 7.47275 10
%_5 Pearson7	648.2	0.60701	x	156.677	0.60701 648.2 78.3385 0.5



S Branch Root River above Etna Creek at 151st Ave 930520

=-> info fit
WSSR=0.990247 DoF=240 WSSR/DoF=0.00412603 SSR=1.03578 R2=0.97155
=-> info peaks

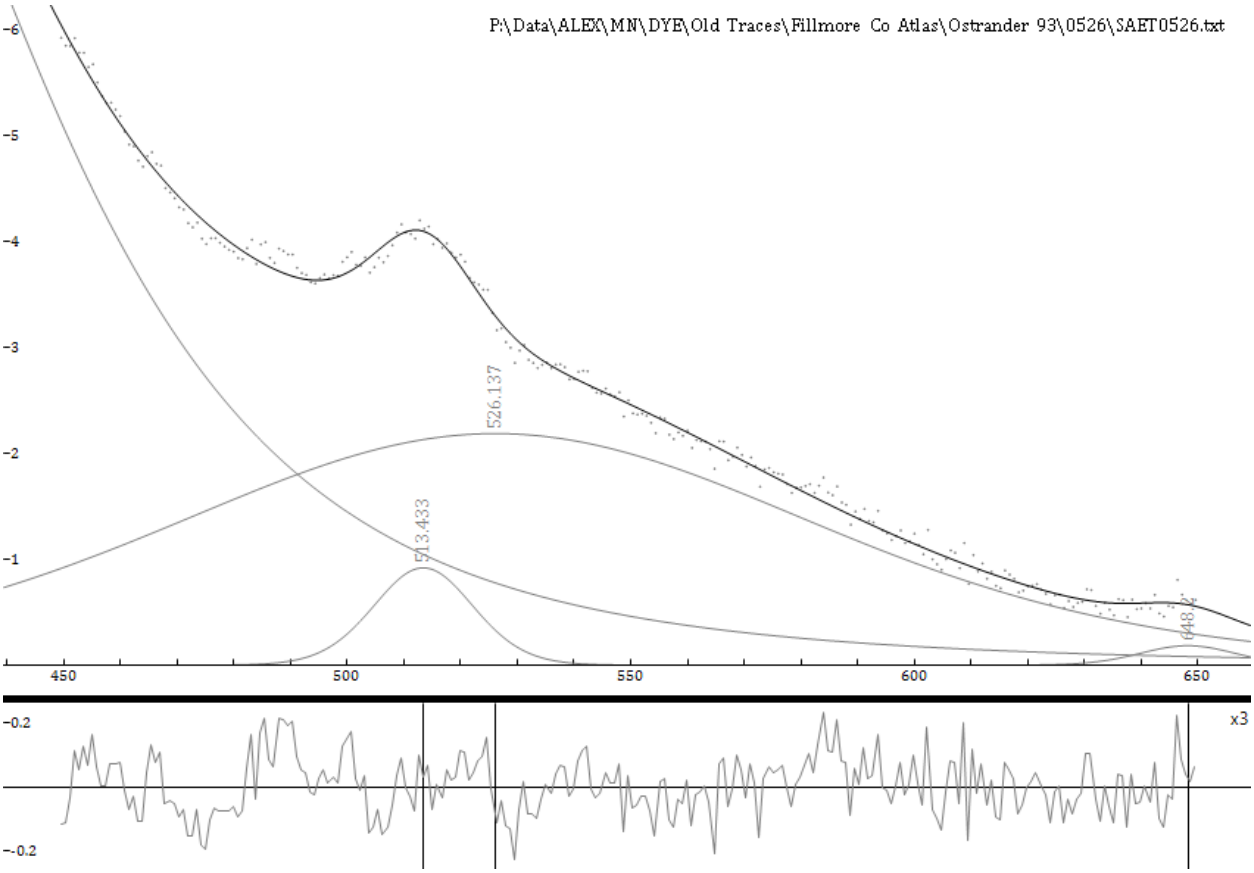
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	450.675	1.14833	x	196.645	1.14833 450.675 98.3224 0.1
%_3 Pearson7	514.93	1.53628	29.246	17.5059	1.53628 514.93 8.75294 10
%_5 Pearson7	648.2	0.377336	3.84613	9.37309	0.377336 648.2 4.68654 10
%_6 Pearson7	566.148	0.652398	17.5468	24.7328	0.652398 566.148 12.3664 10



S Branch Root River above Etna Creek at 151st Ave 930521

=-> info fit
WSSR=1.10449 DoF=241 WSSR/DoF=0.00458295 SSR=1.43465 R2=0.990272
=-> info peaks

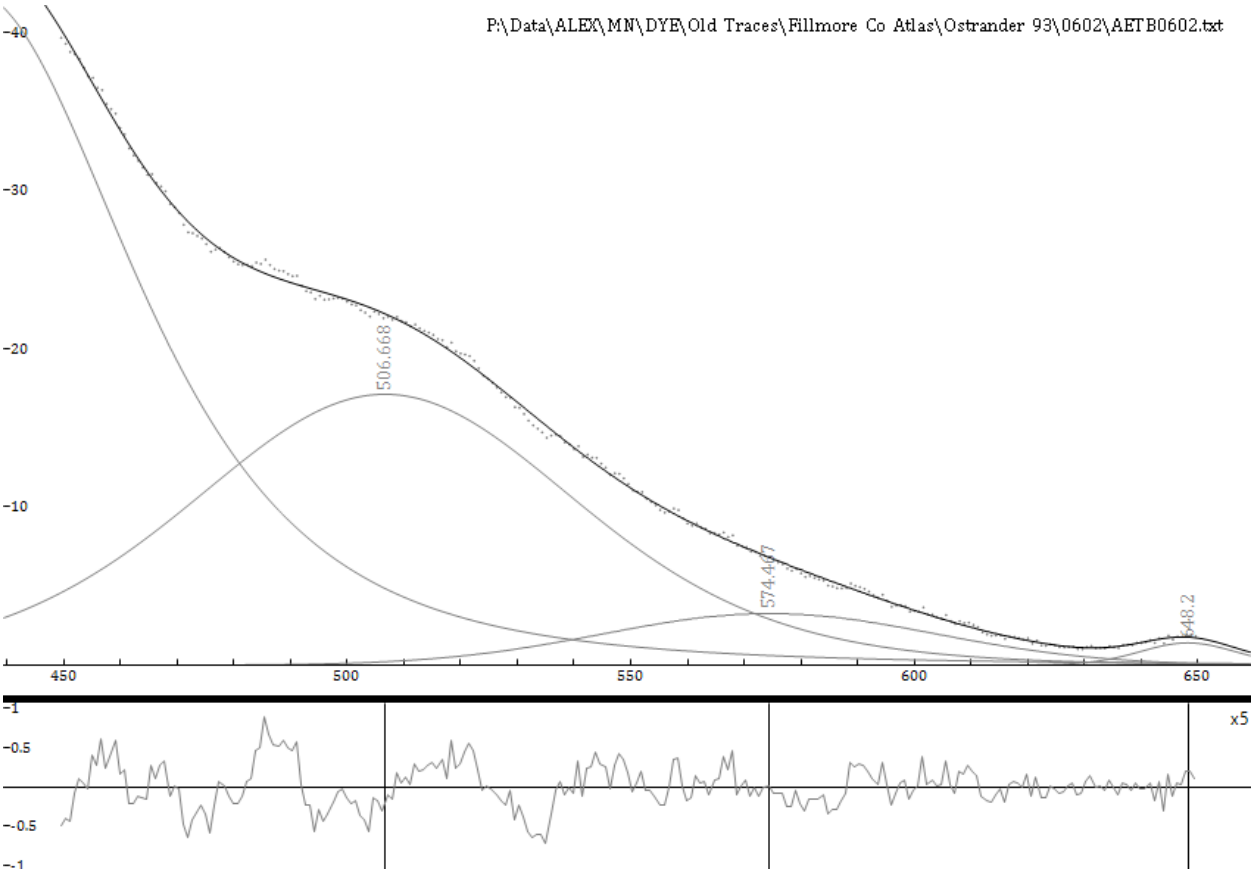
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	437.351	2.51017	x	48.6032	2.51017 437.351 24.3016 0.2
%_3 Pearson7	514.748	0.954261	20.4353	19.6925	0.954261 514.748 9.84626 10
%_5 Pearson7	648.2	0.00694236		0.150991	20 0.00694236 648.2 10 10
%_6 Pearson7	564.856	2.95262	73.185	22.793	2.95262 564.856 11.3965 10



S Branch Root River above Etna Creek at 151st Ave 930526

=-> info fit
WSSR=0.989389 DoF=241 WSSR/DoF=0.00410535 SSR=2.05041 R2=0.996389
=-> info peaks

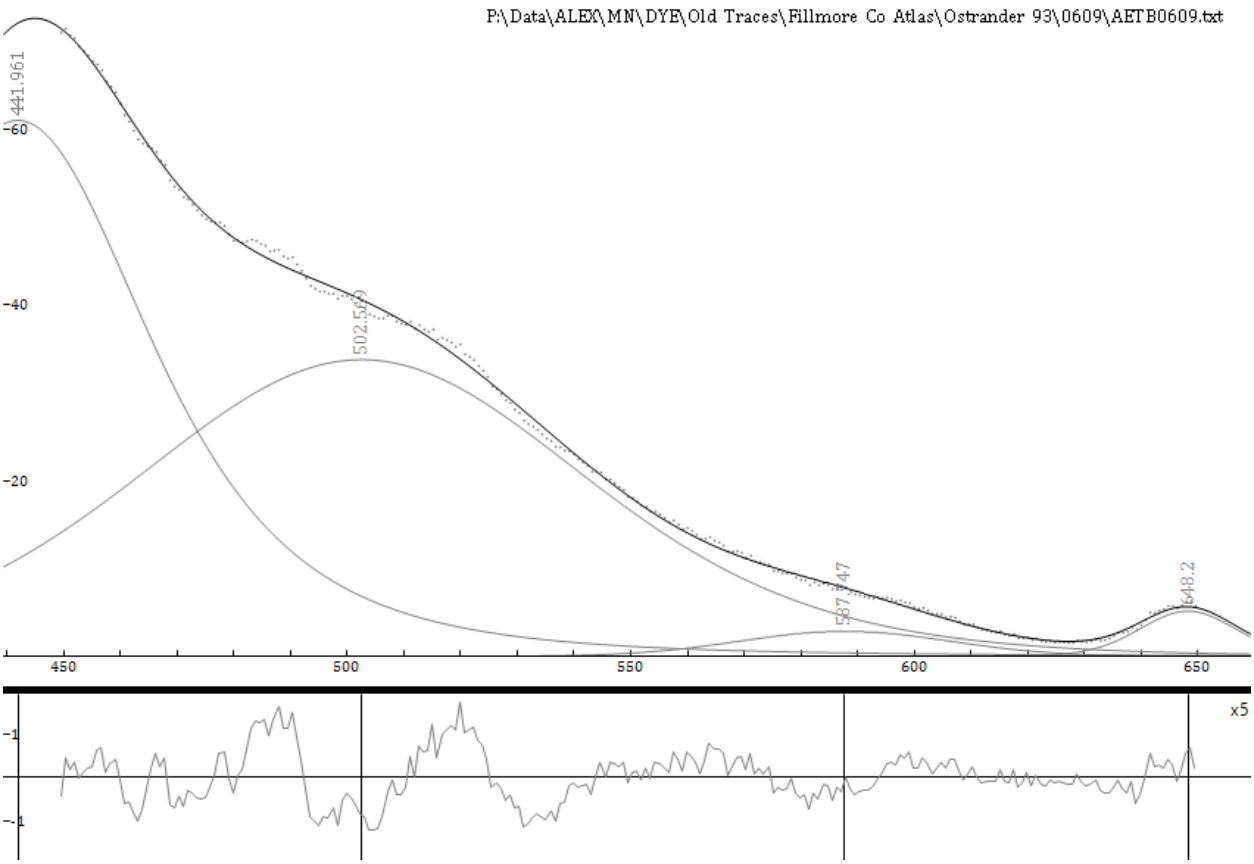
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	398.619	10.3971	1277.82	100.712	10.3971 398.619 50.3558 2
%_3 Pearson7	513.433	0.919823	20.7577	20.7521	0.919823 513.433 10.376 10
%_5 Pearson7	648.2	0.185351	4.03122	20	0.185351 648.2 10 10
%_7 Pearson7	526.137	2.18622	329.501	135.313	2.18622 526.137 67.6564 5



S Branch Root River above Etna Creek at 151st Ave 930602

=-> info fit
WSSR=1.57729 DoF=240 WSSR/DoF=0.00657203 SSR=17.6781 R2=0.999414
=-> info peaks

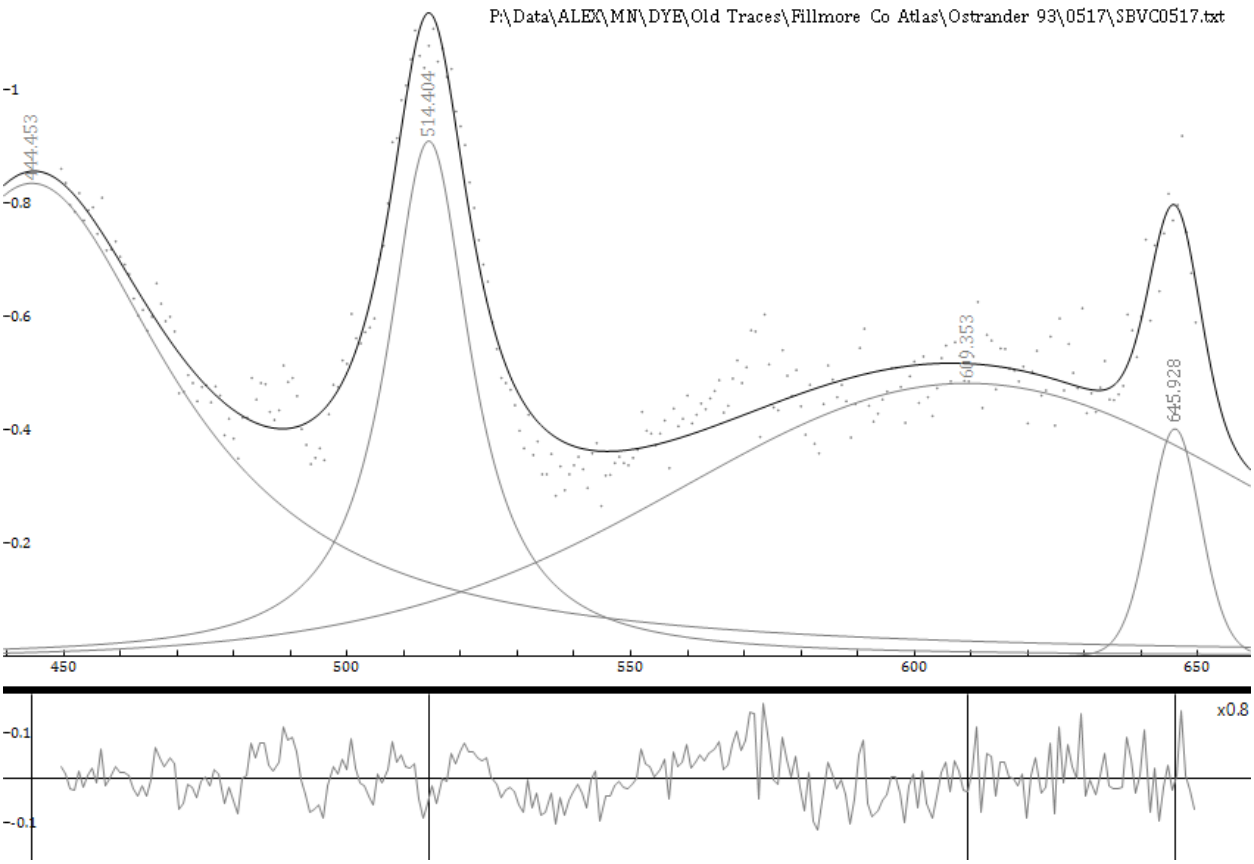
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	433.477	42.621	3497.82	67.2506	42.621 433.477 33.6253 2
%_5 Pearson7	648.2	1.41748	30.8291	20	1.41748 648.2 10 10
%_7 Pearson7	506.668	17.1129	1528.9	80.2103	17.1129 506.668 40.1052 5
%_8 Pearson7	574.467	3.27058	x	68.8102	3.27058 574.467 34.4051 -1.28827e+014



S Branch Root River above Etna Creek at 151st Ave 930609

=-> info fit
WSSR=3.77757 DoF=240 WSSR/DoF=0.0157399 SSR=78.5507 R2=0.999247
=-> info peaks

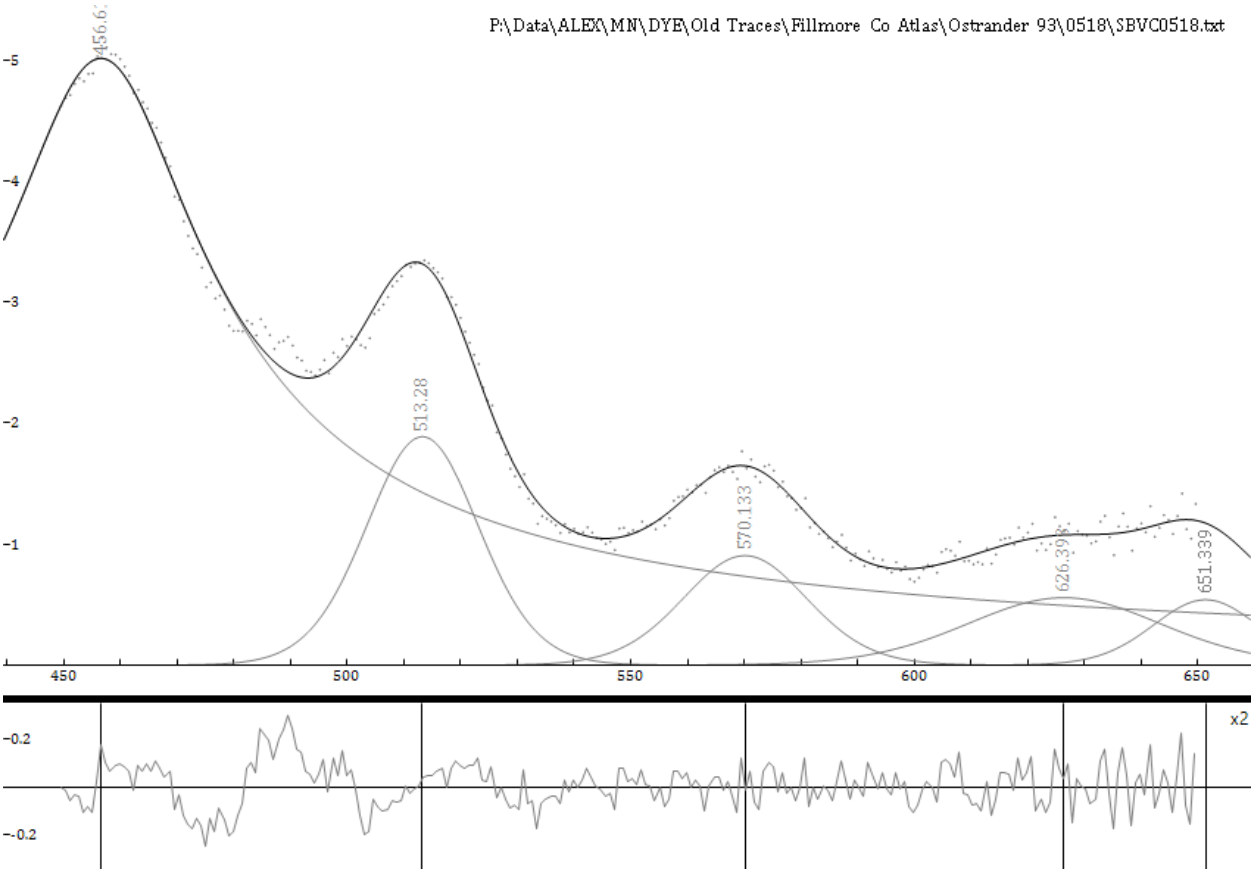
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	441.961	61.004	4117.66	55.3114	61.004 441.961 27.6557 2
%_5 Pearson7	648.2	5.14283	111.852	20	5.14283 648.2 10 10
%_7 Pearson7	502.569	33.7672	3518.24	93.5416	33.7672 502.569 46.7708 5
%_8 Pearson7	587.747	2.84266	x	43.1753	2.84266 587.747 21.5877 -3.05387e+014



South Beaver Creek 930517

=-> info fit
WSSR=0.692398 DoF=239 WSSR/DoF=0.00289706 SSR=0.693467 R2=0.914084
=-> info peaks

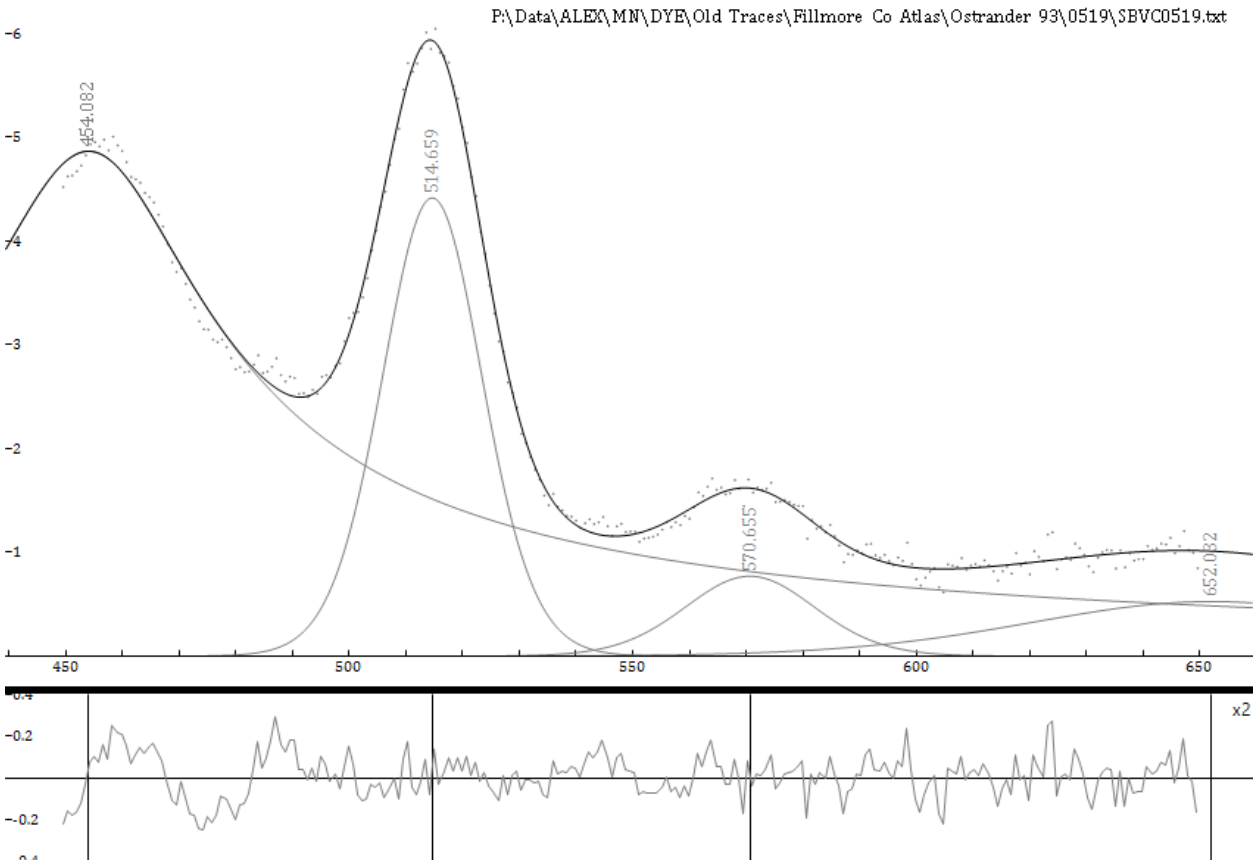
# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	645.928	0.401293	4.61314	10.5711	0.401293 645.928 5.28557 10
%_2 Pearson7	444.453	0.834407	78.8982	60.1962	0.834407 444.453 30.0981 1
%_3 Pearson7	514.404	0.909022	25.4654	17.8343	0.909022 514.404 8.91714 1
%_4 Pearson7	609.353	0.481616	63.6251	121.483	0.481616 609.353 60.7414 10



South Beaver Creek 930518

=-> info fit
WSSR=1.14313 DoF=236 WSSR/DoF=0.00484379 SSR=2.08886 R2=0.994449
=-> info peaks

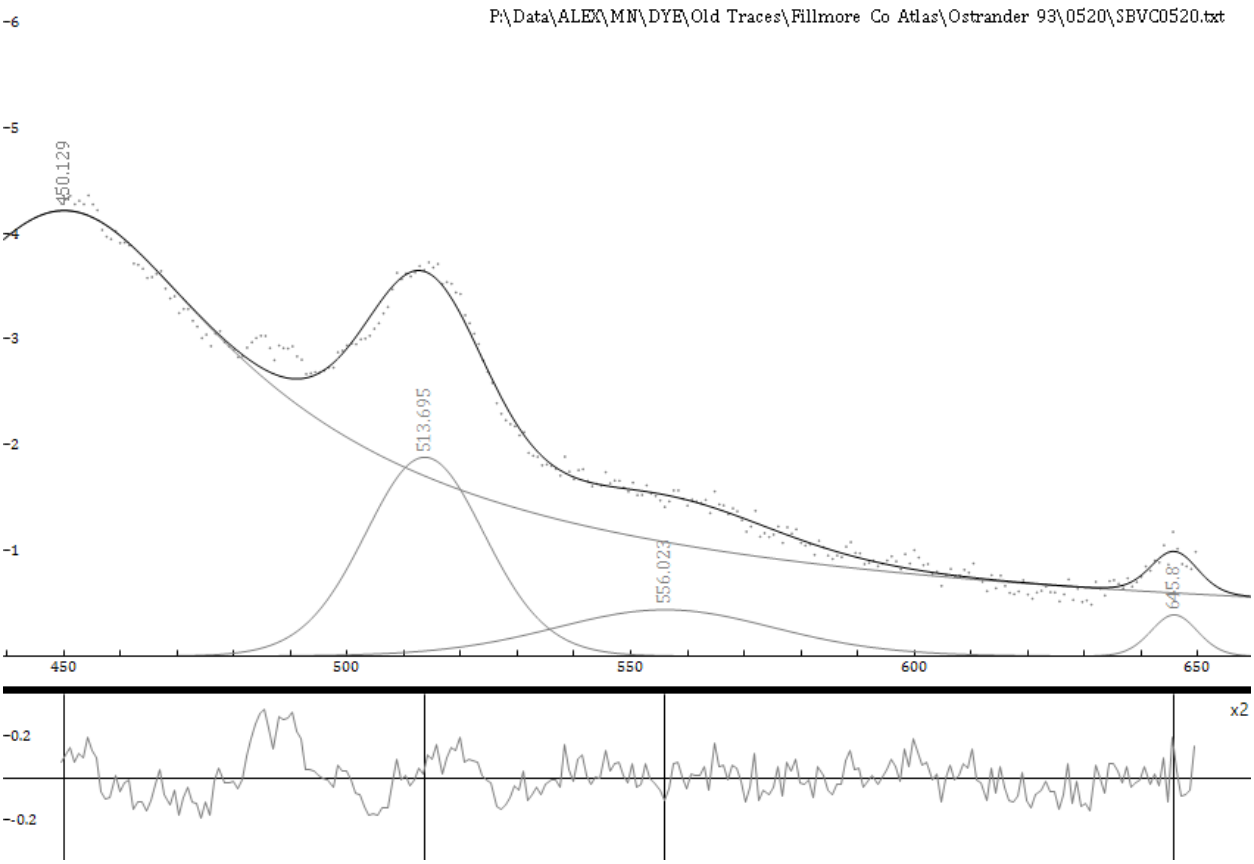
# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	651.339	0.541503	12.9668	22.0201	0.541503 651.339 11.0101 10
%_2 Pearson7	456.615	5.01295	x	58.3059	5.01295 456.615 29.1529 0.5
%_3 Pearson7	513.28	1.8882	48.0623	23.4069	1.8882 513.28 11.7035 10
%_4 Pearson7	626.393	0.558519	24.7729	40.7874	0.558519 626.393 20.3937 10
%_5 Pearson7	570.133	0.905906	25.5178	25.9029	0.905906 570.133 12.9514 10



South Beaver Creek 930519

=-> info fit
WSSR=1.38736 DoF=239 WSSR/DoF=0.00580486 SSR=2.60485 R2=0.995585
=-> info peaks

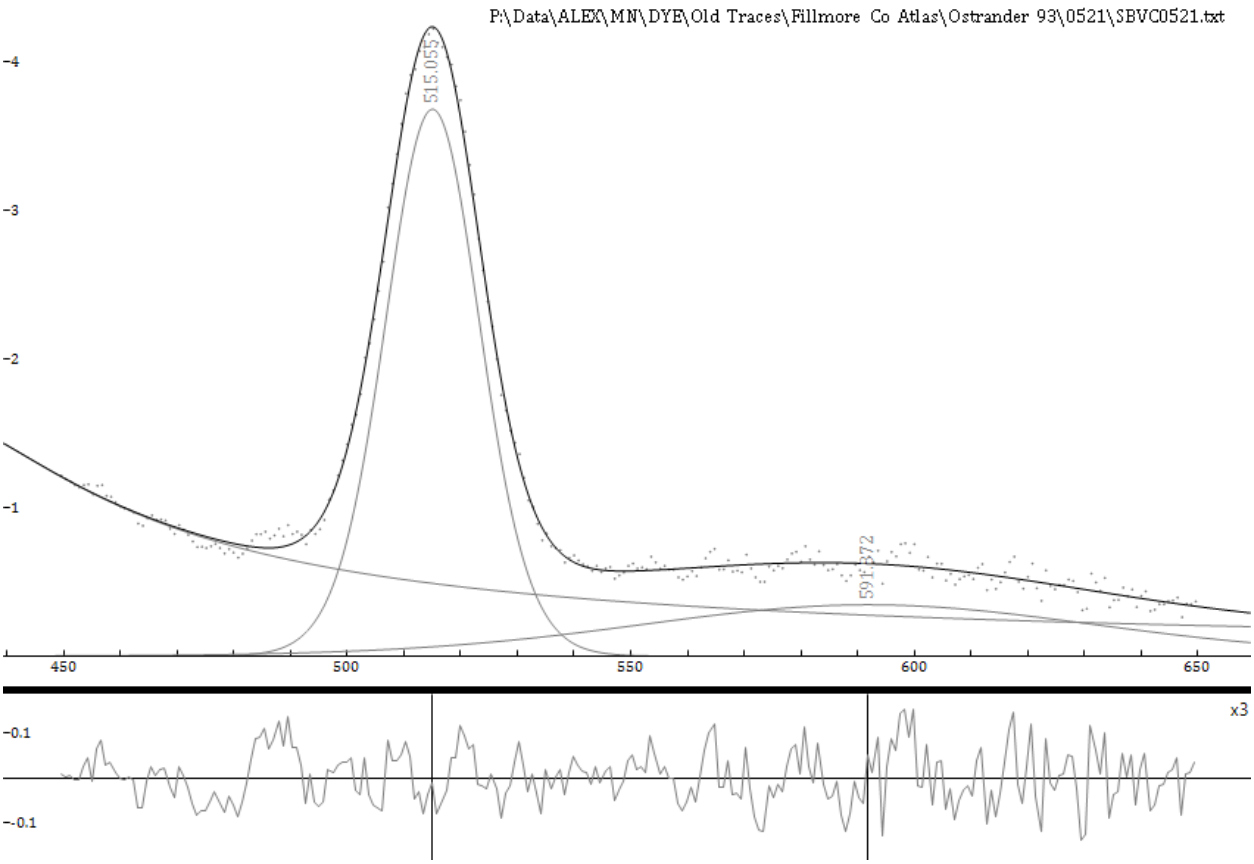
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	454.082	4.86623	x	68.8149	4.86623 454.082 34.4075 0.5
%_3 Pearson7	514.659	4.4165	100.272	20.878	4.4165 514.659 10.439 10
%_4 Pearson7	652.032	0.527581	43.94	76.5876	0.527581 652.032 38.2938 10
%_5 Pearson7	570.655	0.771568	22.9031	27.2965	0.771568 570.655 13.6482 10



South Beaver Creek 930520

=-> info fit
WSSR=1.23242 DoF=239 WSSR/DoF=0.00515659 SSR=2.42729 R2=0.992798
=-> info peaks

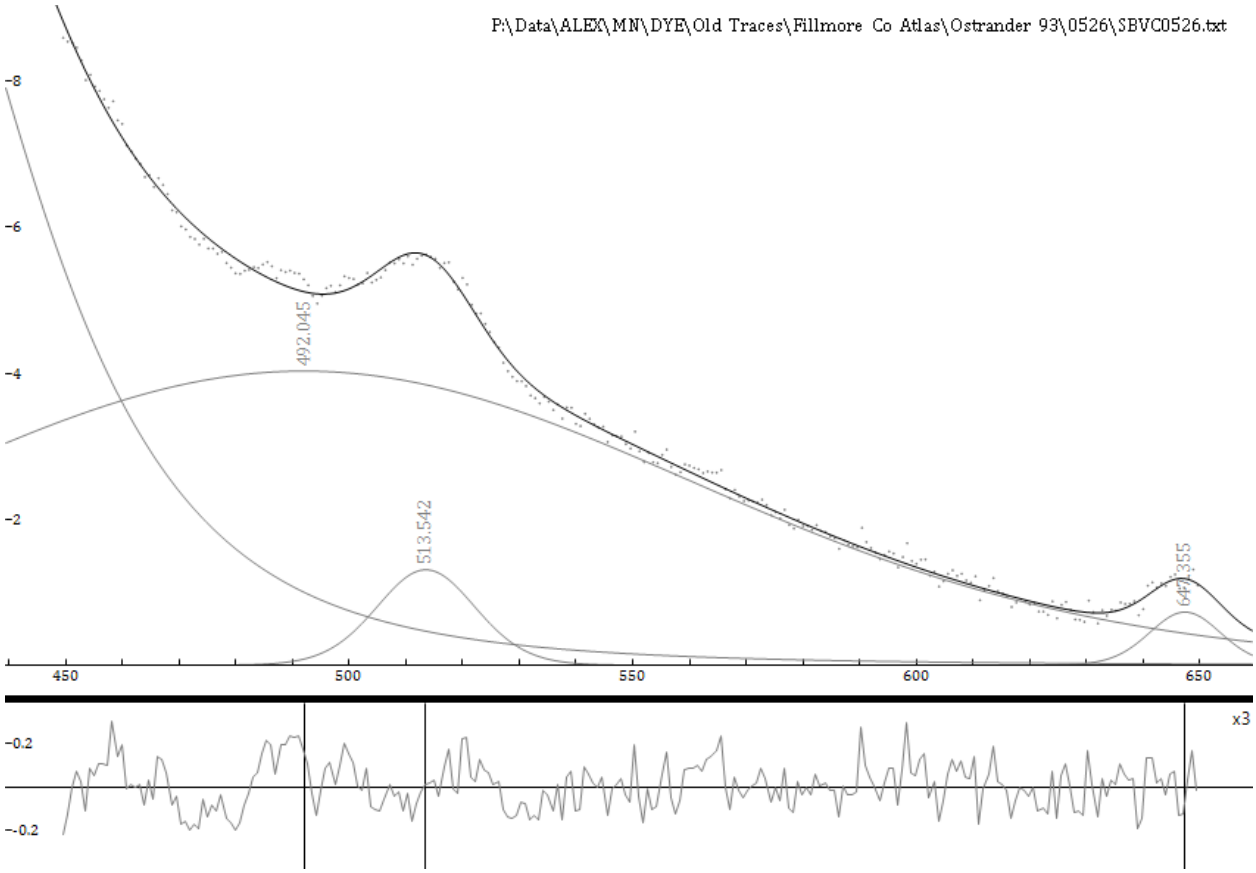
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	450.129	4.21502	x	97.4034	4.21502 450.129 48.7017 0.5
%_3 Pearson7	513.695	1.88244	51.4403	25.1286	1.88244 513.695 12.5643 10
%_4 Pearson7	645.8	0.392333	4.14944	9.7257	0.392333 645.8 4.86285 10
%_5 Pearson7	556.023	0.440375	22.1232	46.1968	0.440375 556.023 23.0984 10



South Beaver Creek 930521

=-> info fit
WSSR=0.795947 DoF=242 WSSR/DoF=0.00328904 SSR=0.875046 R2=0.995812
=-> info peaks

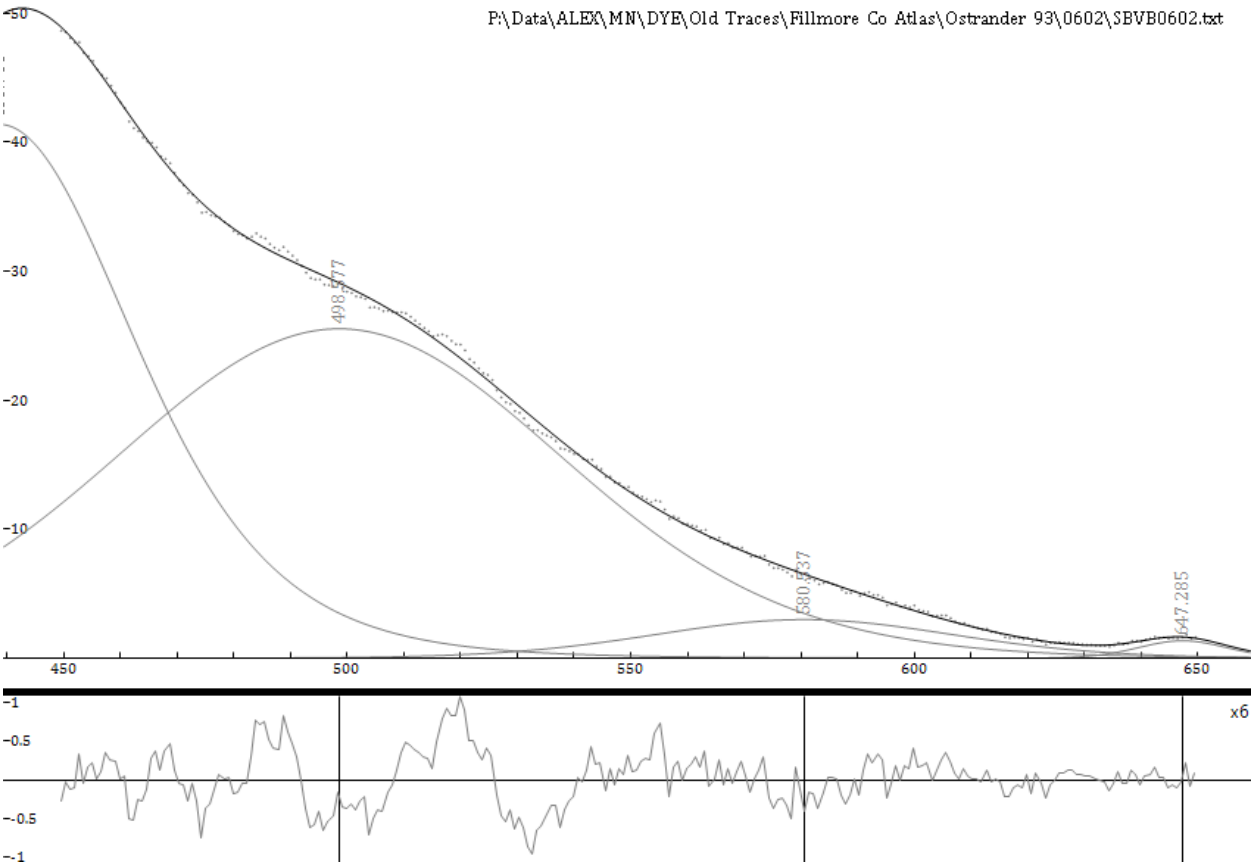
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	422.426	1.66597	x	98.8936	1.66597 422.426 49.4468 0.5
%_3 Pearson7	515.055	3.67772	78.9253	19.7345	3.67772 515.055 9.86723 10
%_5 Pearson7	591.872	0.346408	36.1817	96.048	0.346408 591.872 48.024 10



South Beaver Creek 930526

=-> info fit
WSSR=1.11959 DoF=238 WSSR/DoF=0.00470415 SSR=2.8255 R2=0.997638
=-> info peaks

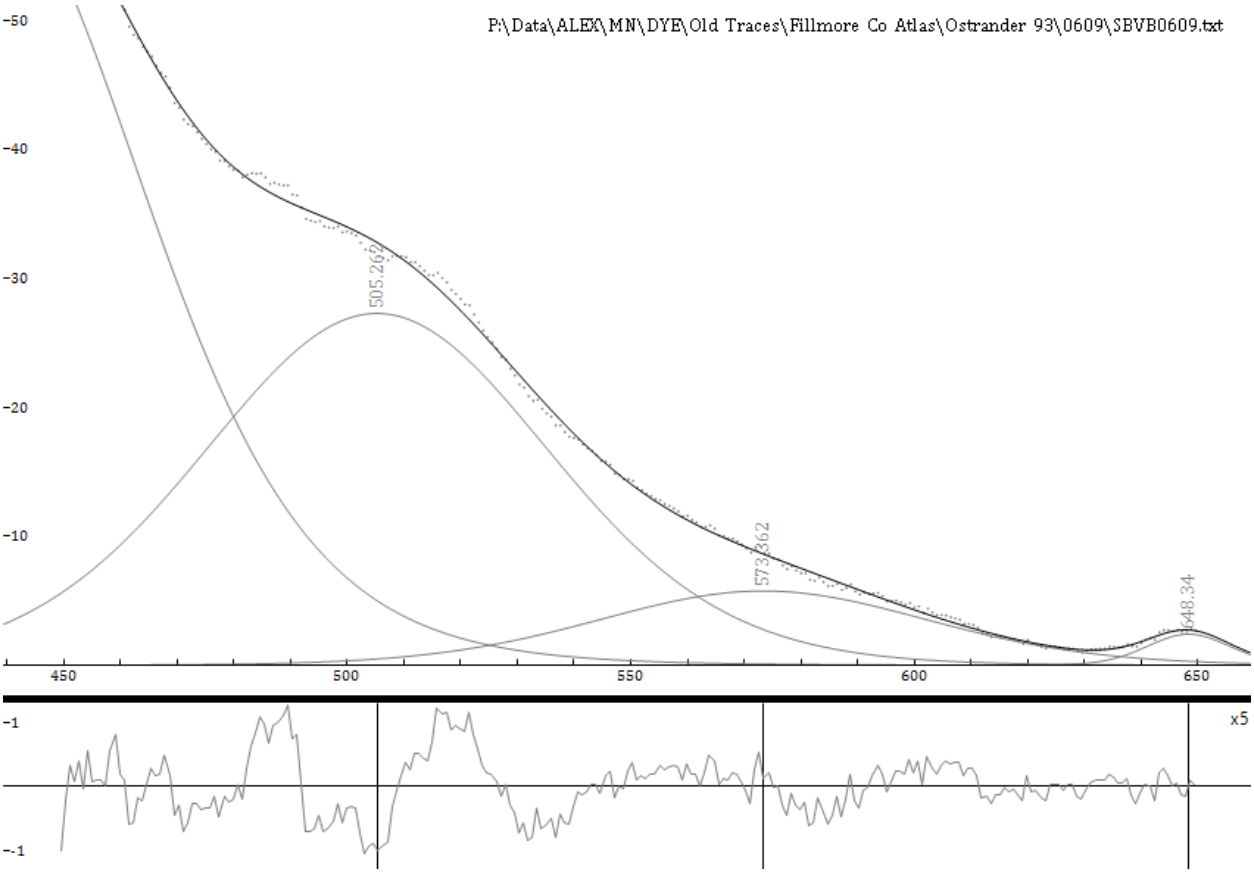
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	412.845	13.0643	1012.23	64.1166	13.0643 412.845 32.0583 2.11653
%_3 Pearson7	513.542	1.30899	29.3075	20.5886	1.30899 513.542 10.2943 10
%_5 Pearson7	492.045	4.031	731.586	166.894	4.031 492.045 83.4468 10
%_6 Pearson7	647.355	0.729509	11.851	14.9386	0.729509 647.355 7.46932 10



South Beaver Creek 930602

=-> info fit
WSSR=1.94232 DoF=238 WSSR/DoF=0.00816101 SSR=27.8963 R2=0.999446
=-> info peaks

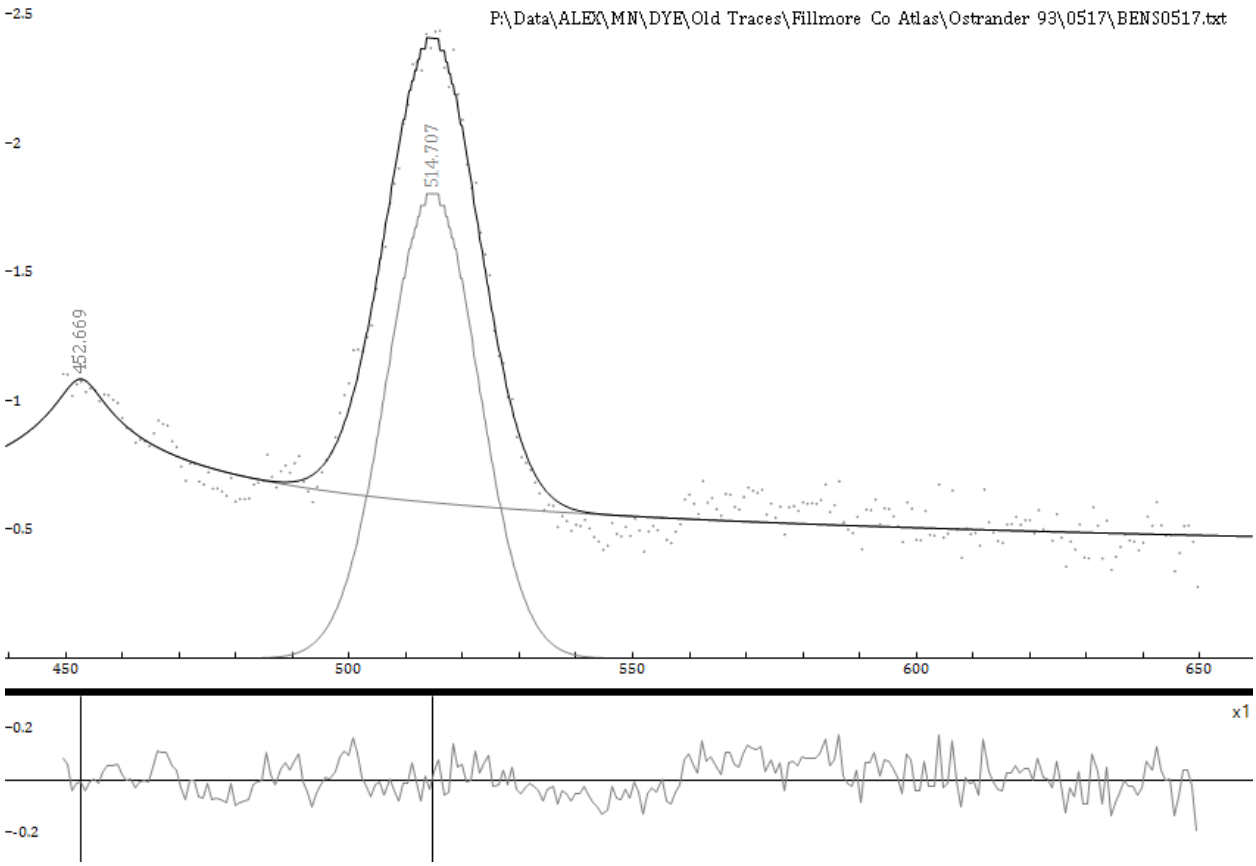
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	438.708	41.4045	2623.91	55.9049	41.4045 438.708 27.9524 3.7518
%_3 Pearson7	498.577	25.5524	2599.83	93.5619	25.5524 498.577 46.781 10
%_5 Pearson7	580.537	3.00164	204.582	62.6752	3.00164 580.537 31.3376 10
%_6 Pearson7	647.285	1.36382	27.4407	18.5022	1.36382 647.285 9.25112 10



South Beaver Creek 930609

=-> info fit
WSSR=2.87014 DoF=238 WSSR/DoF=0.0120594 SSR=48.799 R2=0.999313
=-> info peaks

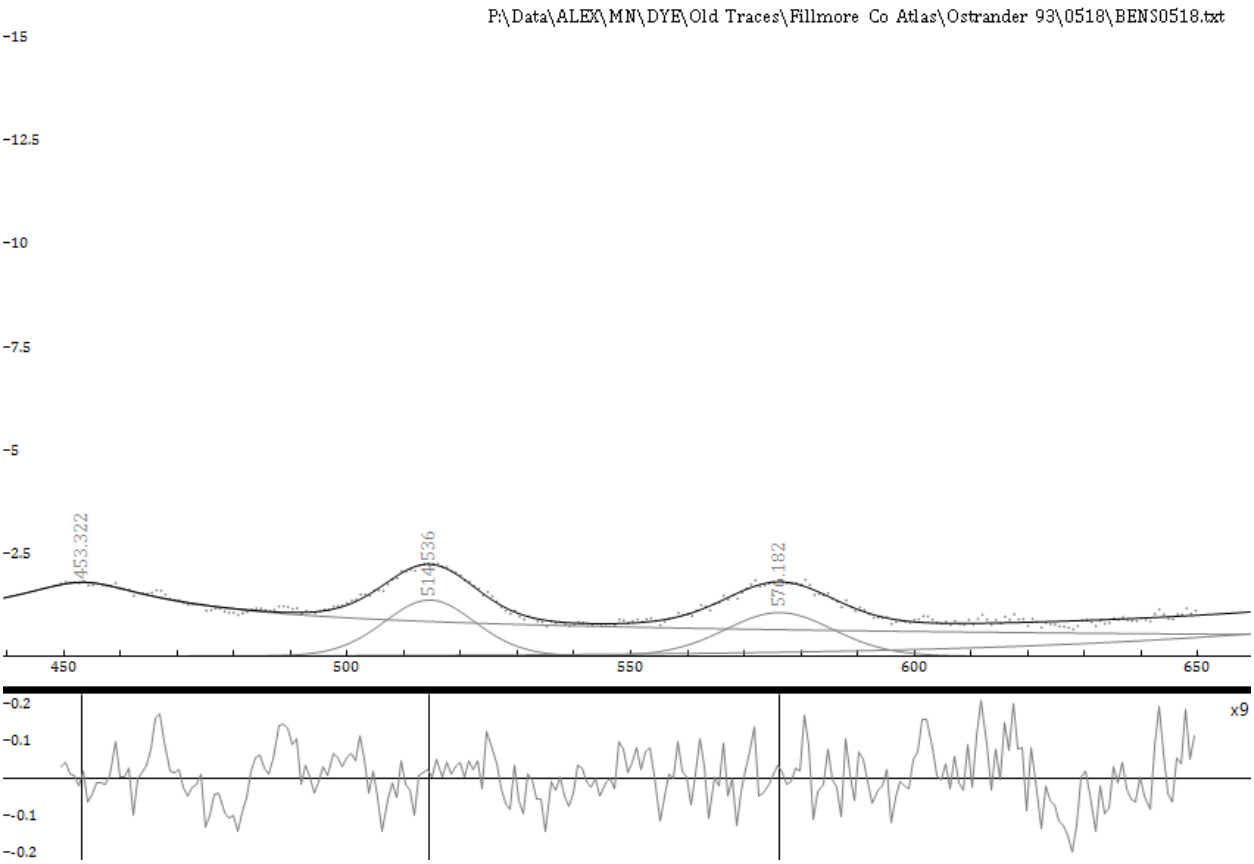
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	435.902	60.9663	4538.79	67.0932	60.9663 435.902 33.5466 5.40913
%_3 Pearson7	505.326	27.2346	2127.81	71.8454	27.2346 505.326 35.9227 10
%_5 Pearson7	573.253	5.78389	435.277	69.2042	5.78389 573.253 34.6021 10
%_6 Pearson7	648.338	2.41303	45.5407	17.355	2.41303 648.338 8.67748 10



Benson Spring 930517

=-> info fit
WSSR=1.17305 DoF=244 WSSR/DoF=0.00480759 SSR=1.23127 R2=0.977937
=-> info peaks

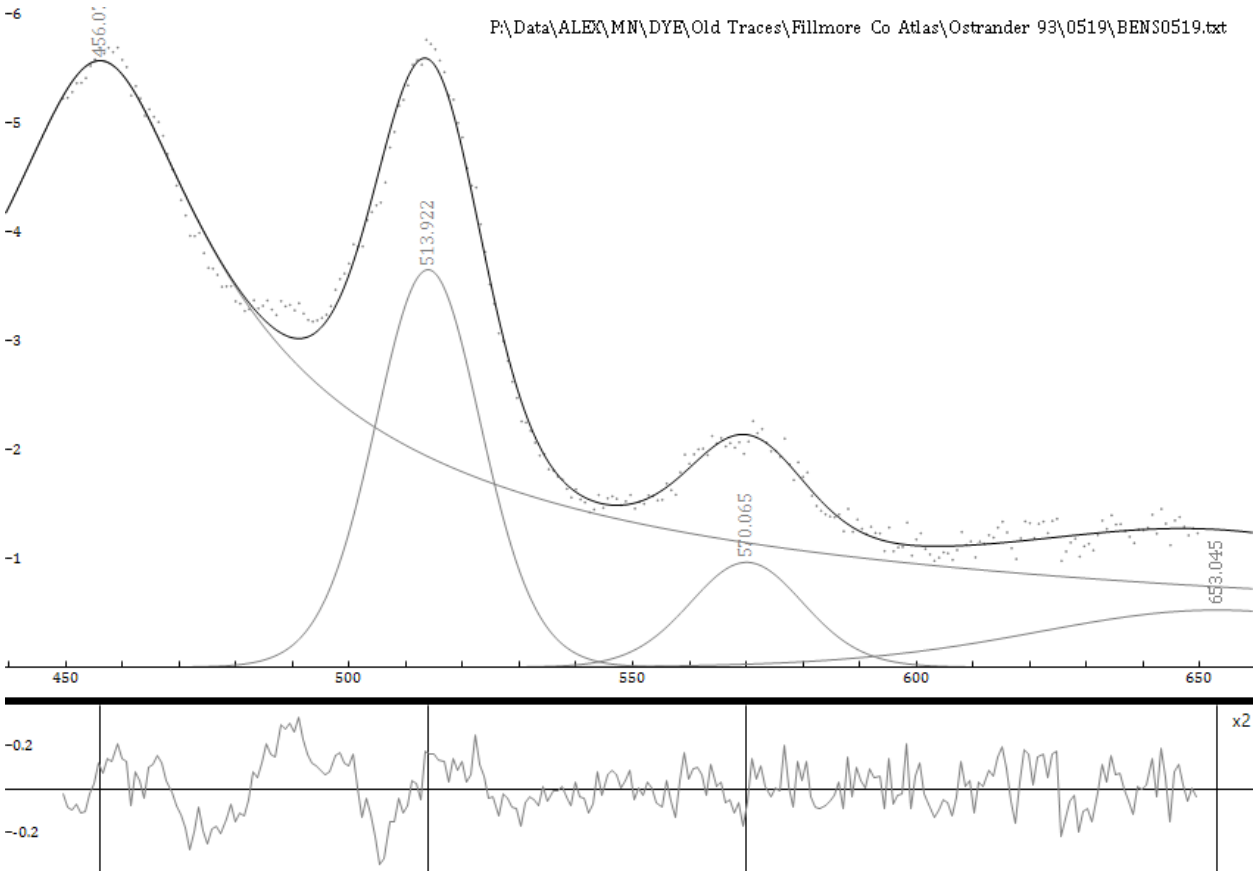
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	452.802	1.08614	x	210.994	1.08614 452.802 105.497 0.100052
%_3 Pearson7	514.723	1.83021	36.596	18.3874	1.83021 514.723 9.19371 10



Benson Spring 930518

=-> info fit
WSSR=1.13165 DoF=238 WSSR/DoF=0.00475482 SSR=1.29979 R2=0.968087
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	865.563	4.7224	1157.9	225.473	4.7224 865.563 112.736 10
%_2 Pearson7	453.322	1.78867	x	104.692	1.78867 453.322 52.3461 0.194961
%_3 Pearson7	514.536	1.36228	28.2406	19.0631	1.36228 514.536 9.53157 10
%_4 Pearson7	576.182	1.05966	26.152	22.6948	1.05966 576.182 11.3474 10



Benson Spring 930519

=-> info fit
WSSR=1.45636 DoF=238 WSSR/DoF=0.00611916 SSR=3.3572 R2=0.994315
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_1 Pearson7	653.045	0.525363	43.6578	76.4169	0.525363 653.045 38.2085 10
%_2 Pearson7	456.072	5.56776	x	69.2921	5.56776 456.072 34.646 0.403673
%_3 Pearson7	513.922	3.64888	87.7631	22.1177	3.64888 513.922 11.0588 10
%_4 Pearson7	570.065	0.963398	24.9563	23.8211	0.963398 570.065 11.9105 10

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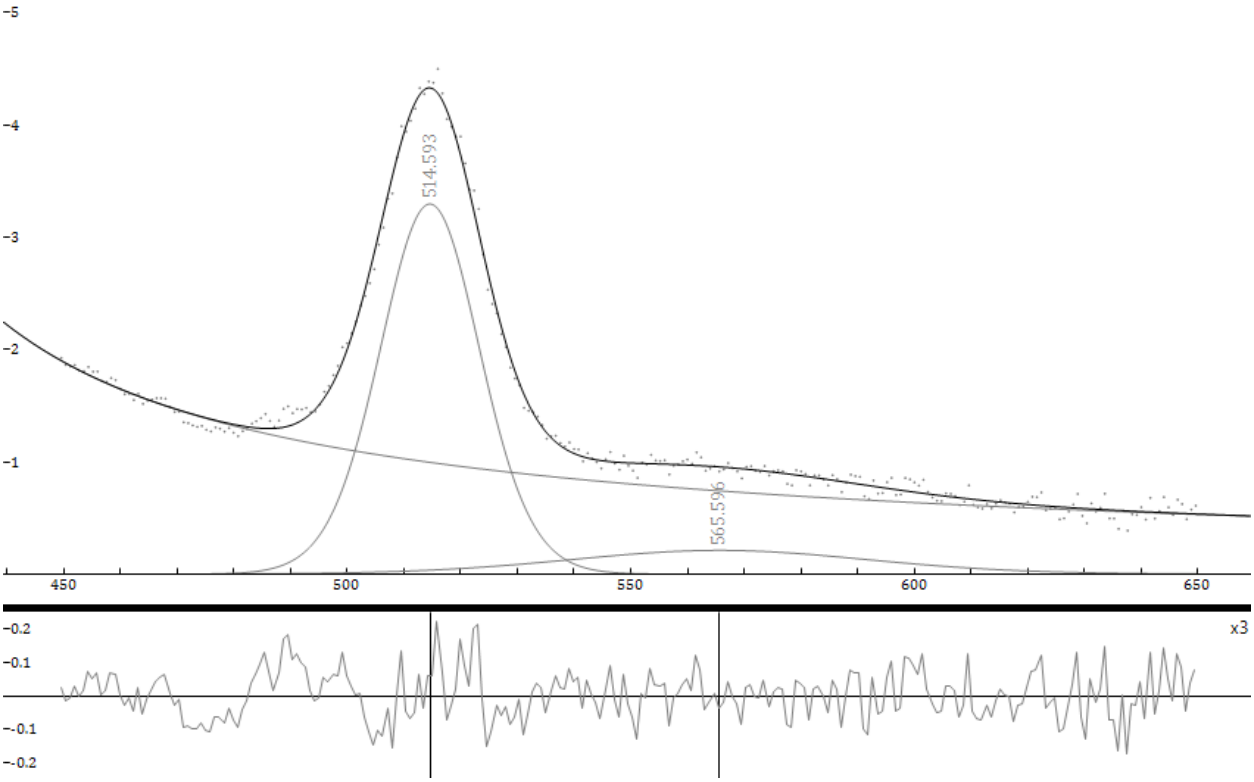

Benson Spring 930520

=-> info fit
WSSR=0.924901 DoF=241 WSSR/DoF=0.00383777 SSR=1.28101 R2=0.994076
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	398.596	5.70523	x	58.0192	5.70523 398.596 29.0096 0.406924
%_3 Pearson7	514.593	3.29465	74.4345	20.7755	3.29465 514.593 10.3878 10
%_4 Pearson7	565.596	0.213015	14.5271	62.7128	0.213015 565.596 31.3564 10

1993 Analyses by SCAlexander, Shimadzu RF-5000 Spectrofluorophotometer, Synchronous Scans Δλ=15nm, 5nm bandwidths.
Peaks fitted with Fityk 1.2.0 using Pearson Type 7 functions in December 2017.

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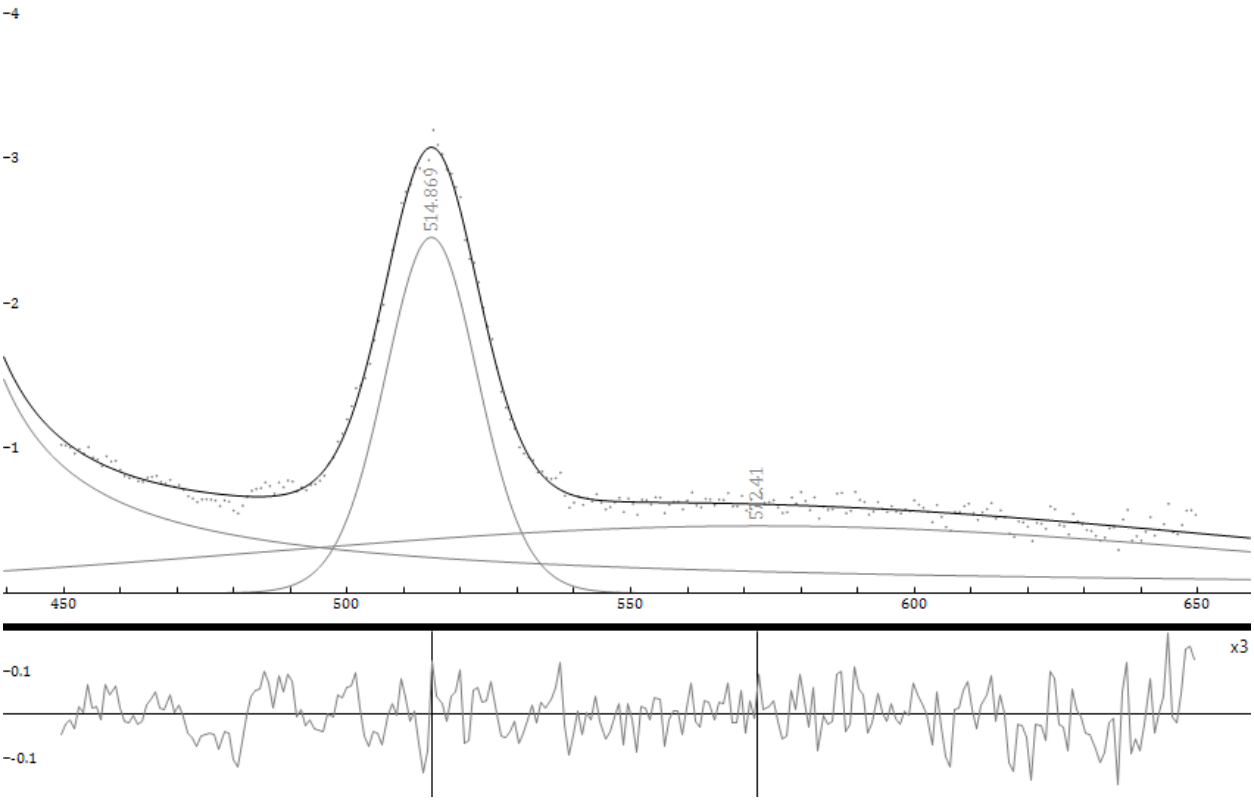
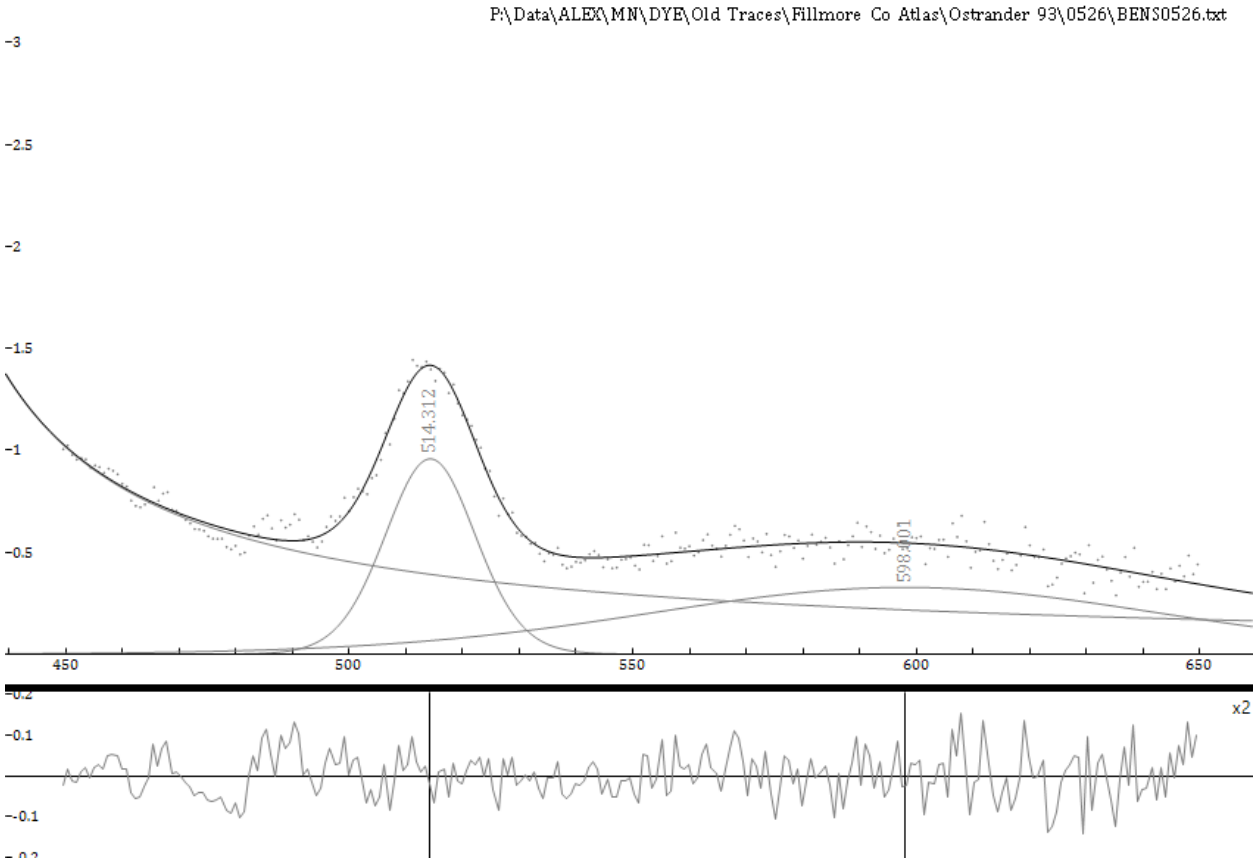


Benson Spring 930521

=-> info fit
WSSR=0.741975 DoF=242 WSSR/DoF=0.00306601 SSR=0.812918 R2=0.9917
=-> info peaks

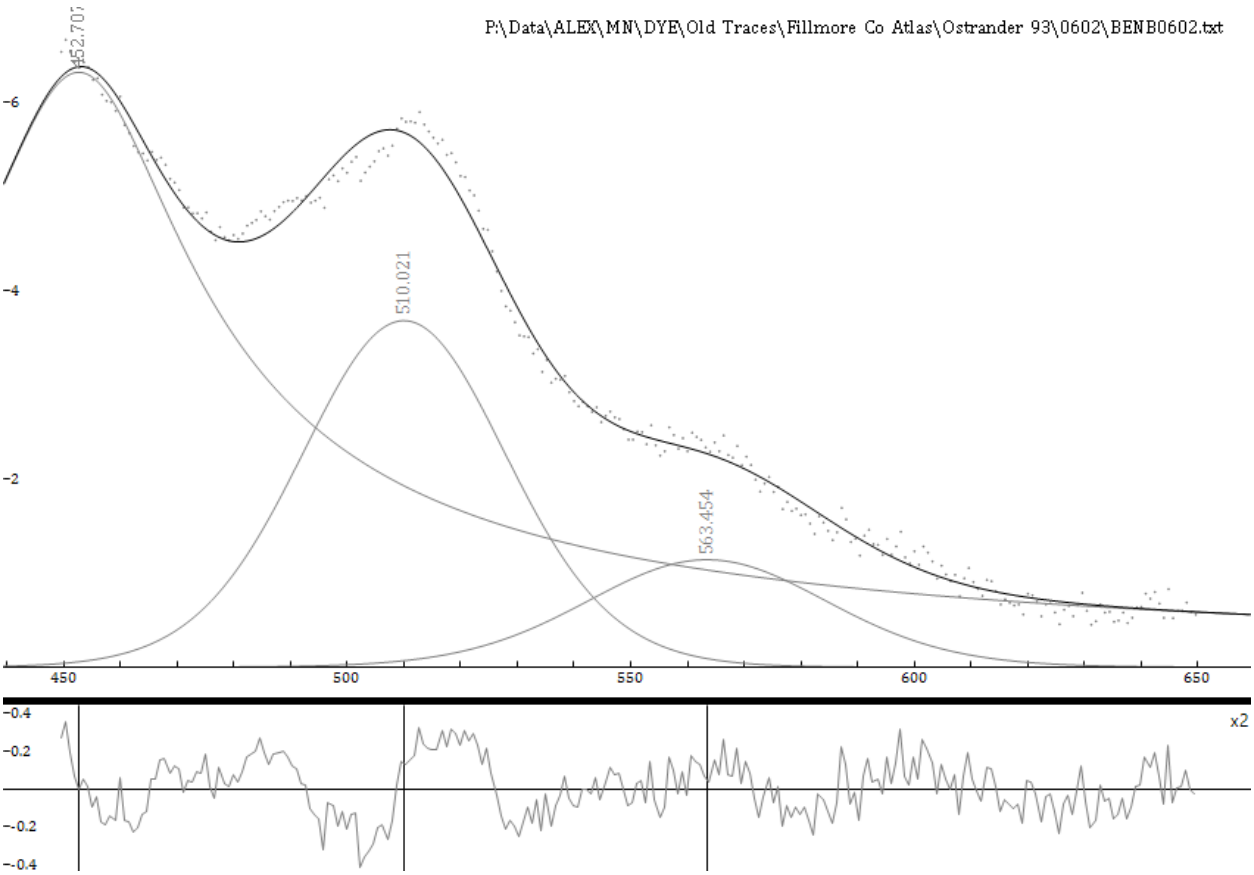
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	424.821	6.38975	x	12.0578	6.38975 424.821 6.02888 0.5
%_3 Pearson7	514.869	2.45527	51.7247	19.3725	2.45527 514.869 9.68623 10
%_4 Pearson7	572.41	0.464537	105.527	208.897	0.464537 572.41 104.448 10



Benson Spring 930526

=-> info fit
WSSR=0.75228 DoF=242 WSSR/DoF=0.0031086 SSR=0.759694 R2=0.94971
=-> info peaks

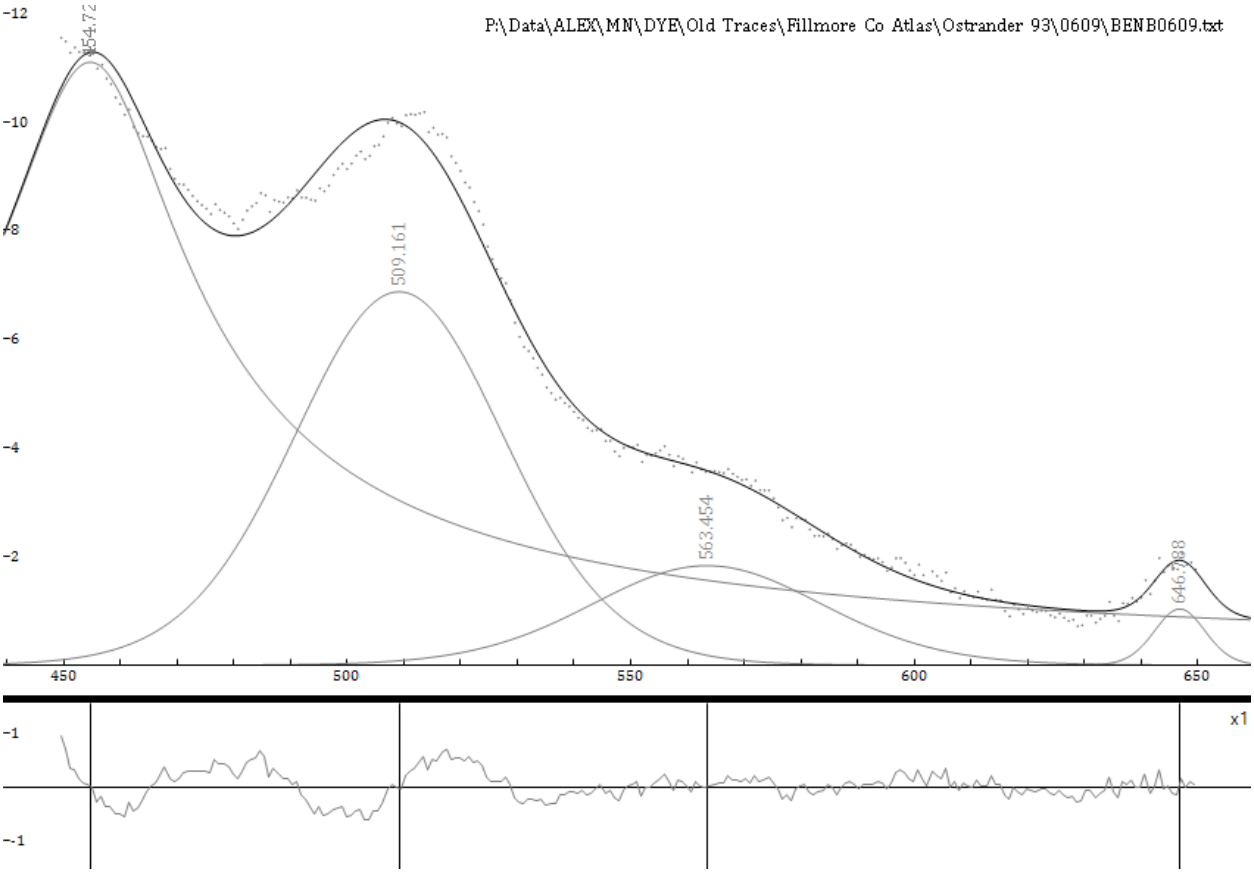
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	409.846	10.5979	x	13.4037	10.5979 409.846 6.70186 0.5
%_3 Pearson7	514.312	0.958159	19.6579	18.8663	0.958159 514.312 9.43313 10
%_4 Pearson7	598.001	0.328181	38.5359	107.979	0.328181 598.001 53.9894 10



Benson Spring 930602

=-> info fit
WSSR=2.08067 DoF=243 WSSR/DoF=0.00856241 SSR=5.45605 R2=0.994319
=-> info peaks

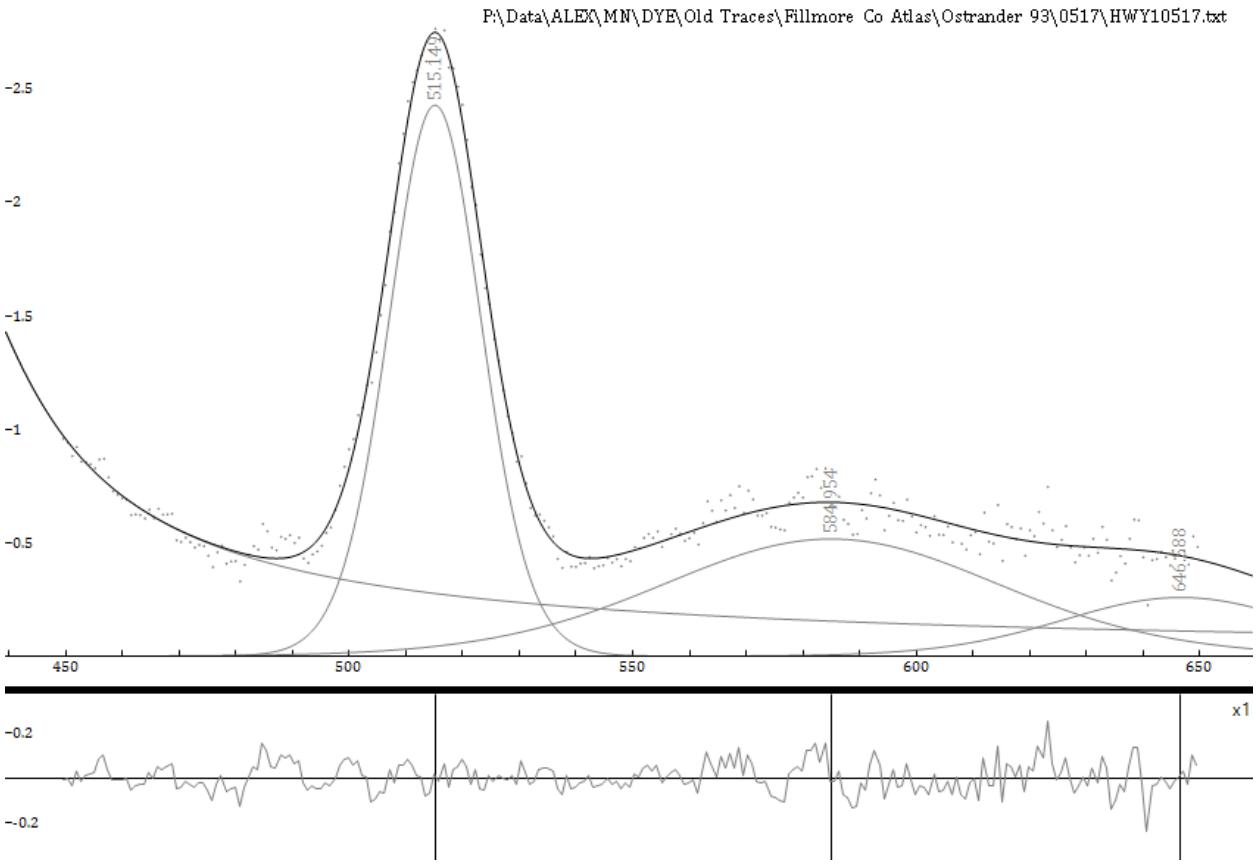
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	452.707	6.30919	x	63.6152	6.30919 452.707 31.8076 0.5
%_3 Pearson7	510.021	3.6757	171.639	42.9401	3.6757 510.021 21.4701 10
%_4 Pearson7	563.454	1.1407	62.6863	50.5343	1.1407 563.454 -25.2672 10



Benson Spring 930609

=-> info fit
WSSR=3.113 DoF=240 WSSR/DoF=0.0129708 SSR=17.6624 R2=0.994306
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	454.729	11.093	x	53.6237	11.093 454.729 26.8119 0.5
%_3 Pearson7	509.161	6.87031	329.225	44.066	6.87031 509.161 22.033 10
%_4 Pearson7	563.454	1.83255	96.6648	48.5064	1.83255 563.454 24.2532 10
%_1 Pearson7	646.788	1.03651	11.9298	10.5839	1.03651 646.788 5.29193 10



S Branch Root River at Co. Hwy 1 930517

=-> info fit
WSSR=0.958056 DoF=241 WSSR/DoF=0.00397534 SSR=0.996447 R2=0.986583
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	427.712	1.96632	x	43.0831	1.96632 427.712 21.5415 0.5
%_3 Pearson7	515.149	2.42726	51.0371	19.3356	2.42726 515.149 9.66779 10
%_4 Pearson7	584.954	0.516685	39.7695	70.7802	0.516685 584.954 35.3901 10
%_1 Pearson7	646.588	0.25927	14.078	49.9316	0.25927 646.588 24.9658 10

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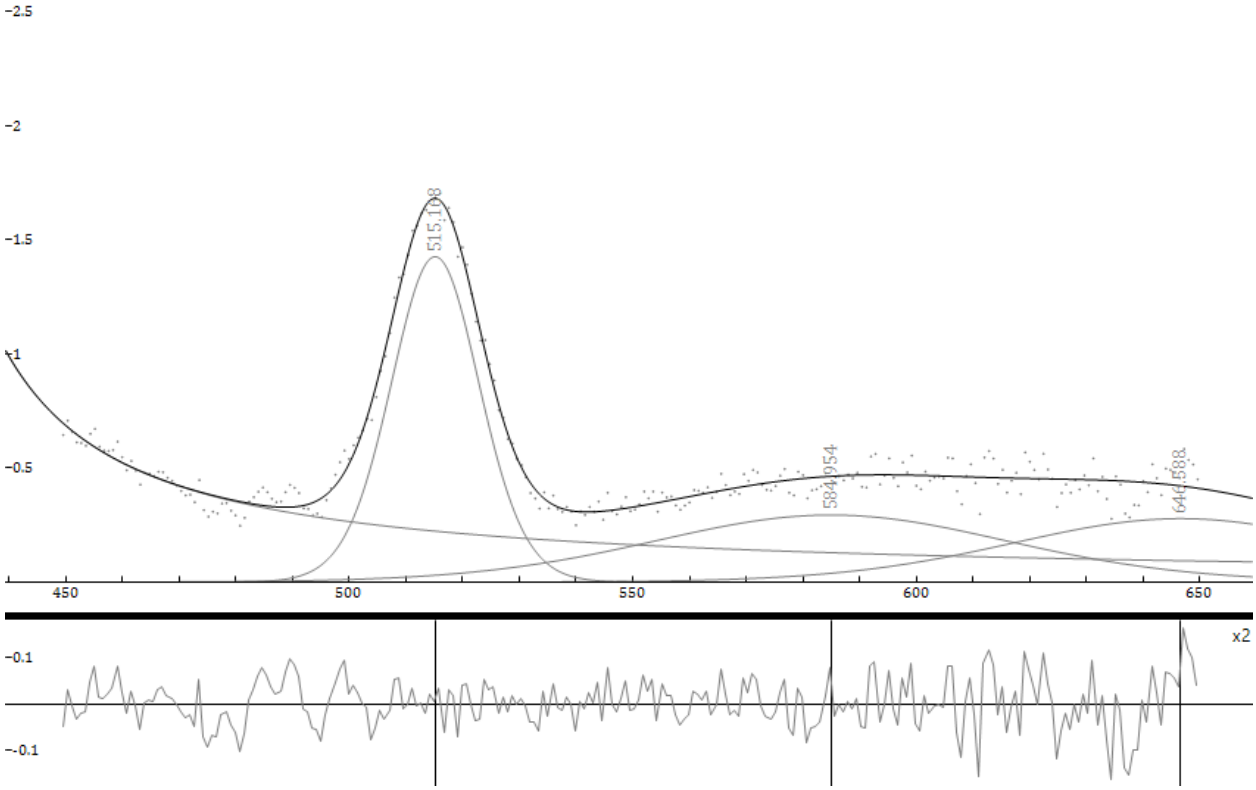
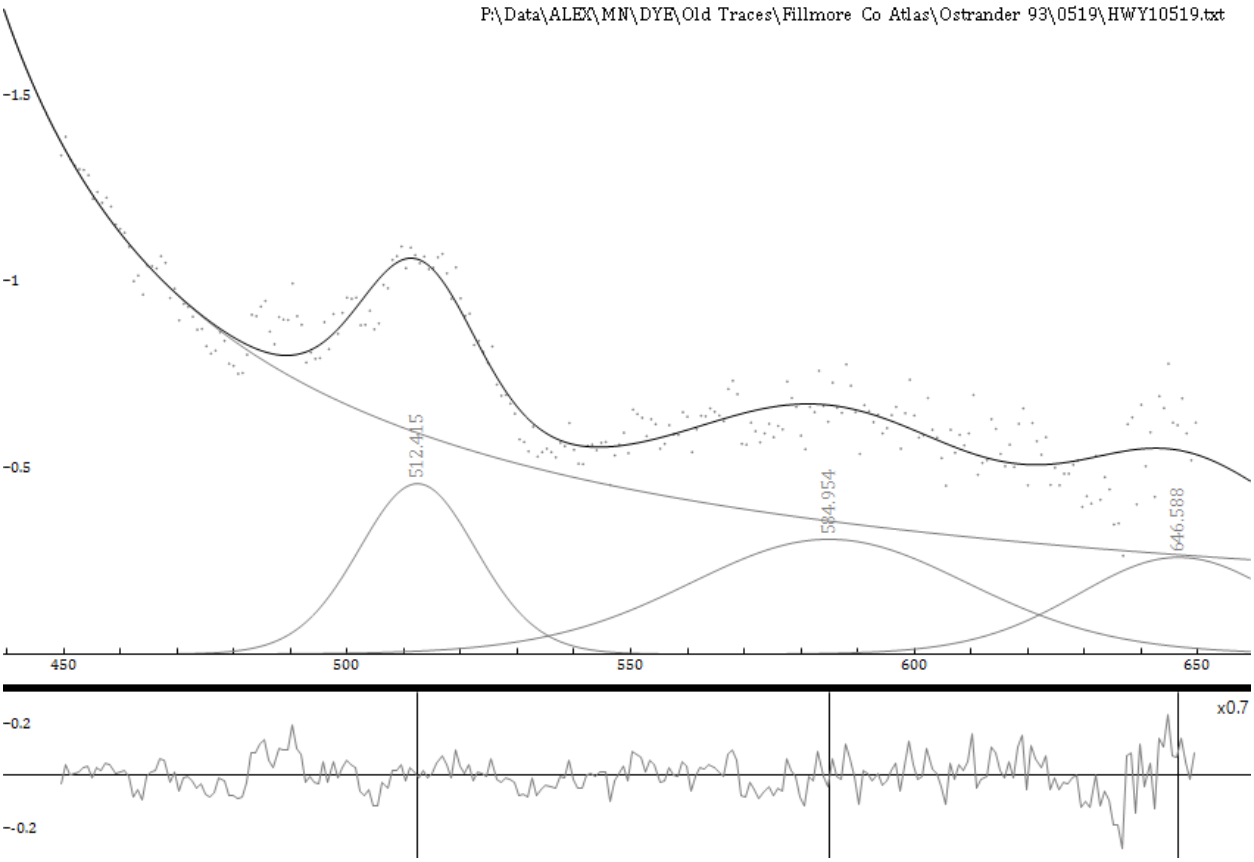


S Branch Root River at Co. Hwy 1 930518

=-> info fit
WSSR=0.696238 DoF=241 WSSR/DoF=0.00288896 SSR=0.703672 R2=0.970388
=-> info peaks

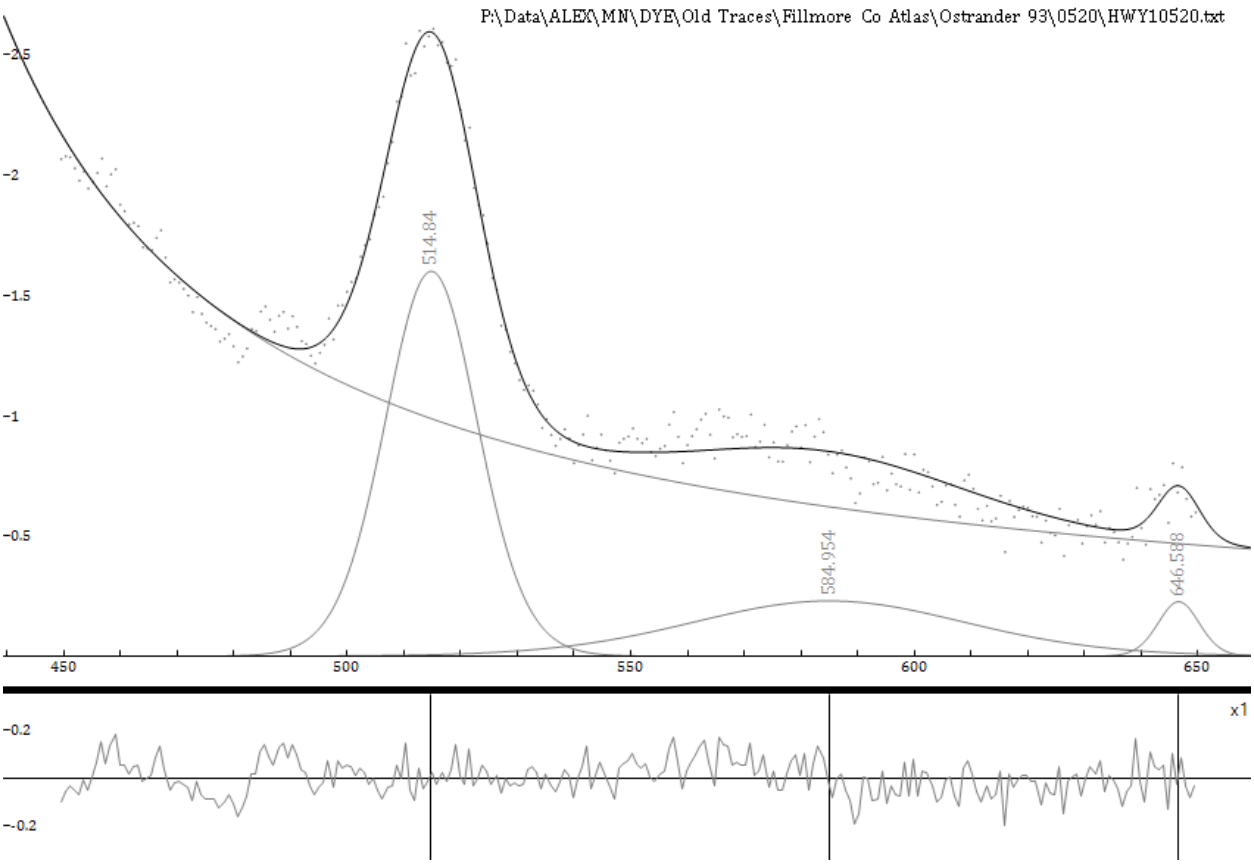
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	419.7	2.8404	x	26.1885	2.8404 419.7 13.0943 0.5
%_3 Pearson7	515.168	1.4262	28.5628	18.4165	1.4262 515.168 9.20823 10
%_4 Pearson7	584.954	0.294806	23.8617	74.4305	0.294806 584.954 37.2153 10
%_1 Pearson7	646.588	0.278895	21.5879	71.1796	0.278895 646.588 35.5898 10



S Branch Root River at Co. Hwy 1 930519

=-> info fit
WSSR=1.13028 DoF=241 WSSR/DoF=0.00468996 SSR=1.13395 R2=0.908301
=-> info peaks

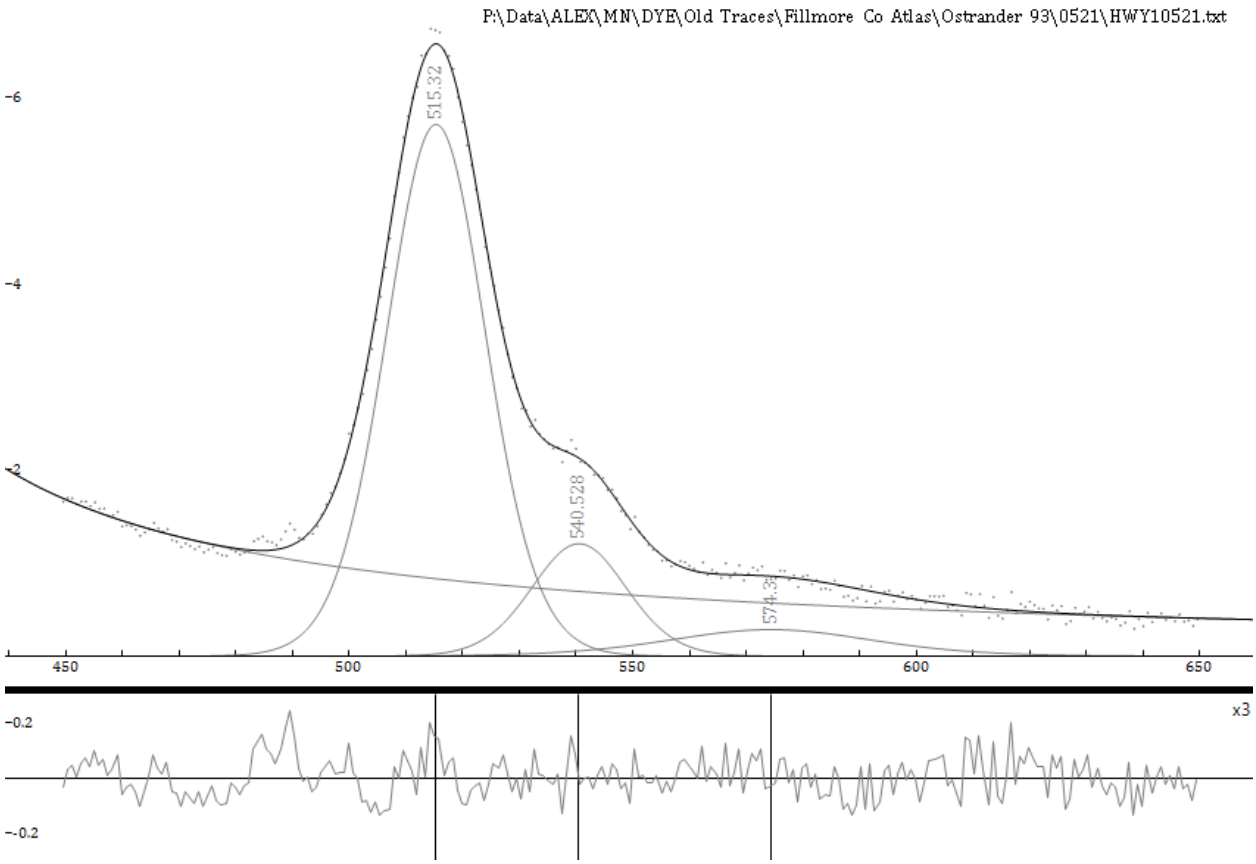
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	403.587	5.86602	x	38.3308	5.86602 403.587 19.1654 0.5
%_3 Pearson7	512.415	0.457245	12.3054	24.7476	0.457245 512.415 12.3738 10
%_4 Pearson7	584.954	0.308309	19.8072	59.0777	0.308309 584.954 29.5389 10
%_1 Pearson7	646.588	0.259932	12.1258	42.8981	0.259932 646.588 21.449 10



S Branch Root River at Co. Hwy 1 930520

=-> info fit
WSSR=1.12632 DoF=241 WSSR/DoF=0.00467354 SSR=1.32418 R2=0.983081
=-> info peaks

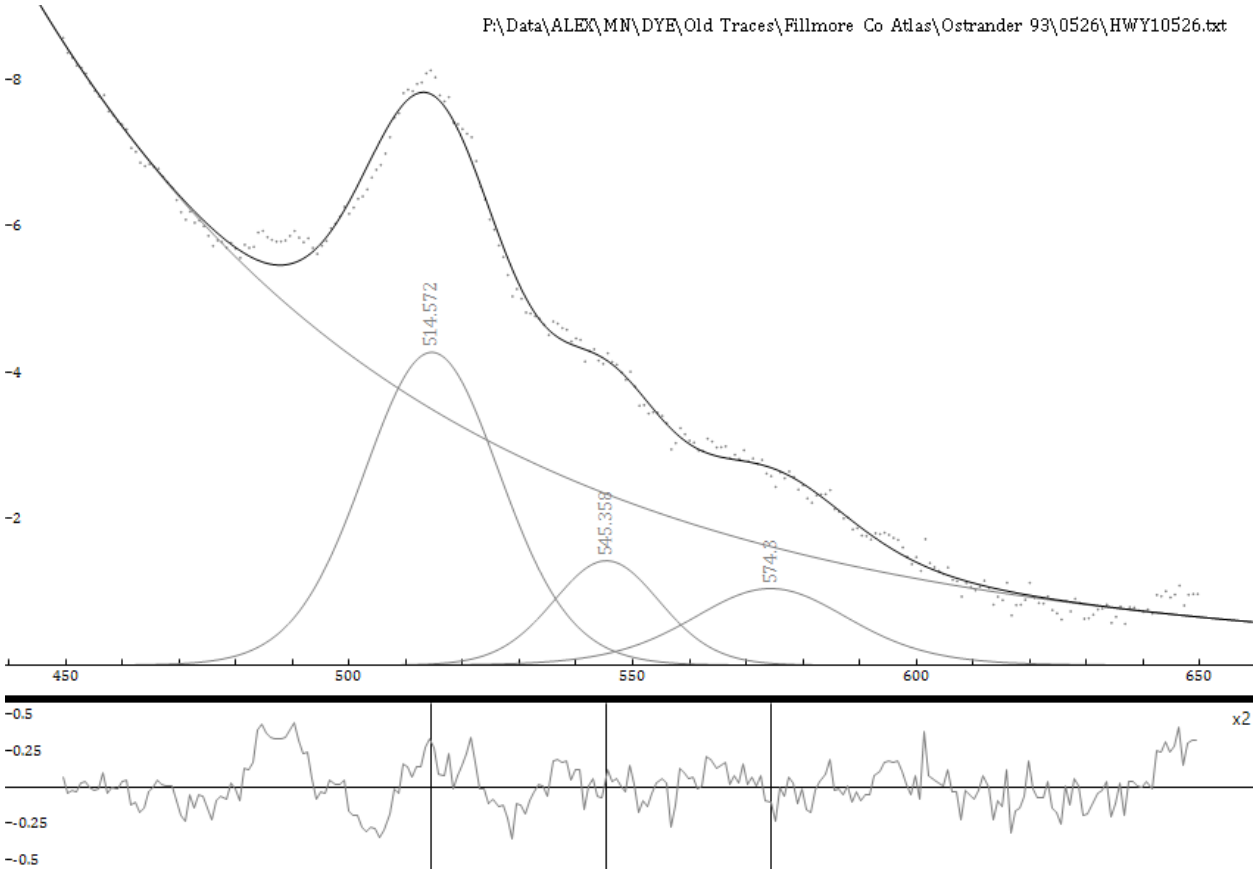
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	396.616	11.419	x	35.5652	11.419 396.616 17.7826 0.5
%_3 Pearson7	514.84	1.6	33.5899	19.3053	1.6 514.84 9.65265 10
%_4 Pearson7	584.954	0.230211	14.3854	57.4624	0.230211 584.954 28.7312 10
%_1 Pearson7	646.588	0.226943	2.12351	8.6045	0.226943 646.588 4.30225 10



S Branch Root River at Co. Hwy 1 930521

=-> info fit
WSSR=0.932901 DoF=240 WSSR/DoF=0.00388709 SSR=1.26534 R2=0.997807
=-> info peaks

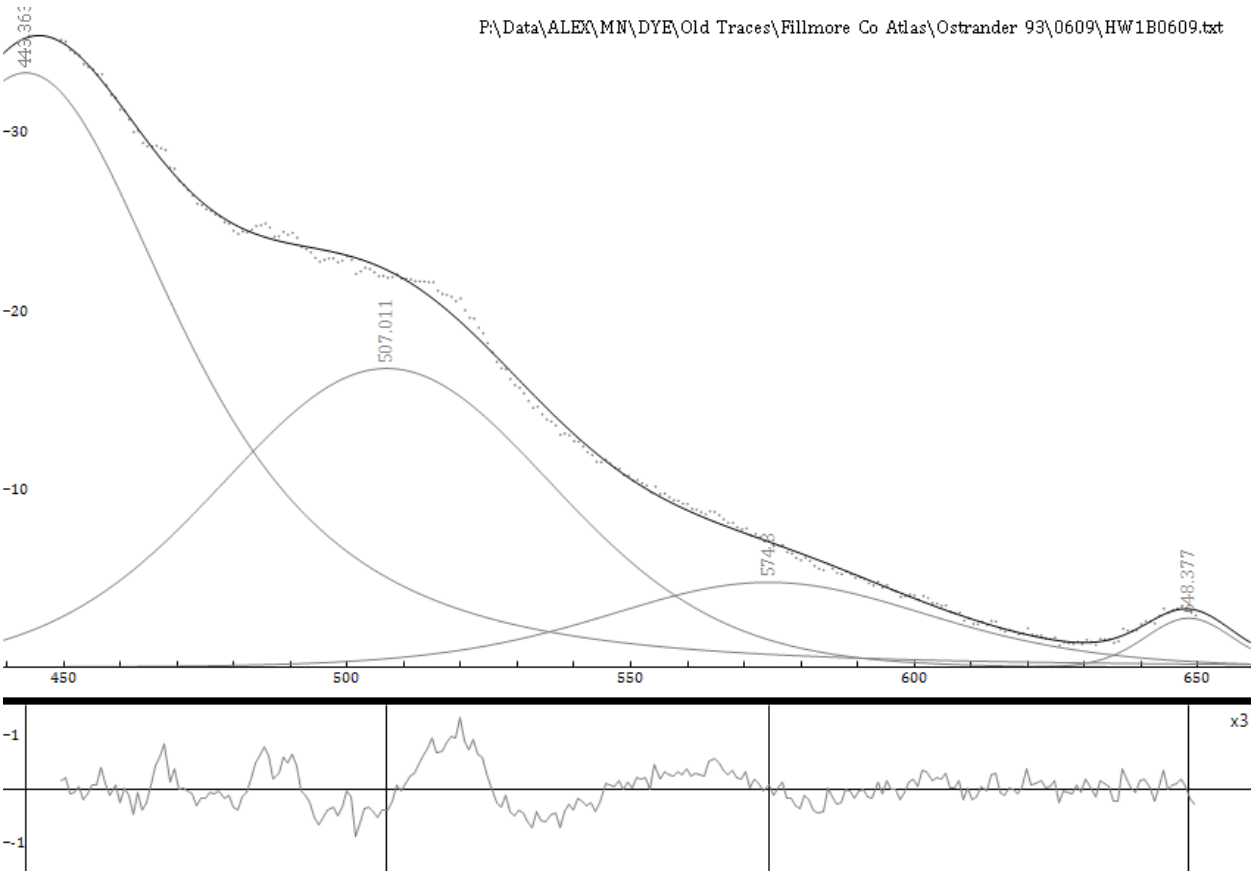
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	386.419	19.3223	x	19.2637	19.3223 386.419 9.63186 0.5
%_3 Pearson7	515.32	5.70736	128.454	20.6966	5.70736 515.32 10.3483 10
%_4 Pearson7	540.528	1.20796	25.9898	19.7851	1.20796 540.528 9.89254 10
%_5 Pearson7	574.3	0.286475	13.5869	42.5802	0.286475 574.3 21.2901 5



S Branch Root River at Co. Hwy 1 930526

=-> info fit
WSSR=2.4934 DoF=239 WSSR/DoF=0.0104327 SSR=6.09518 R2=0.996053
=-> info peaks

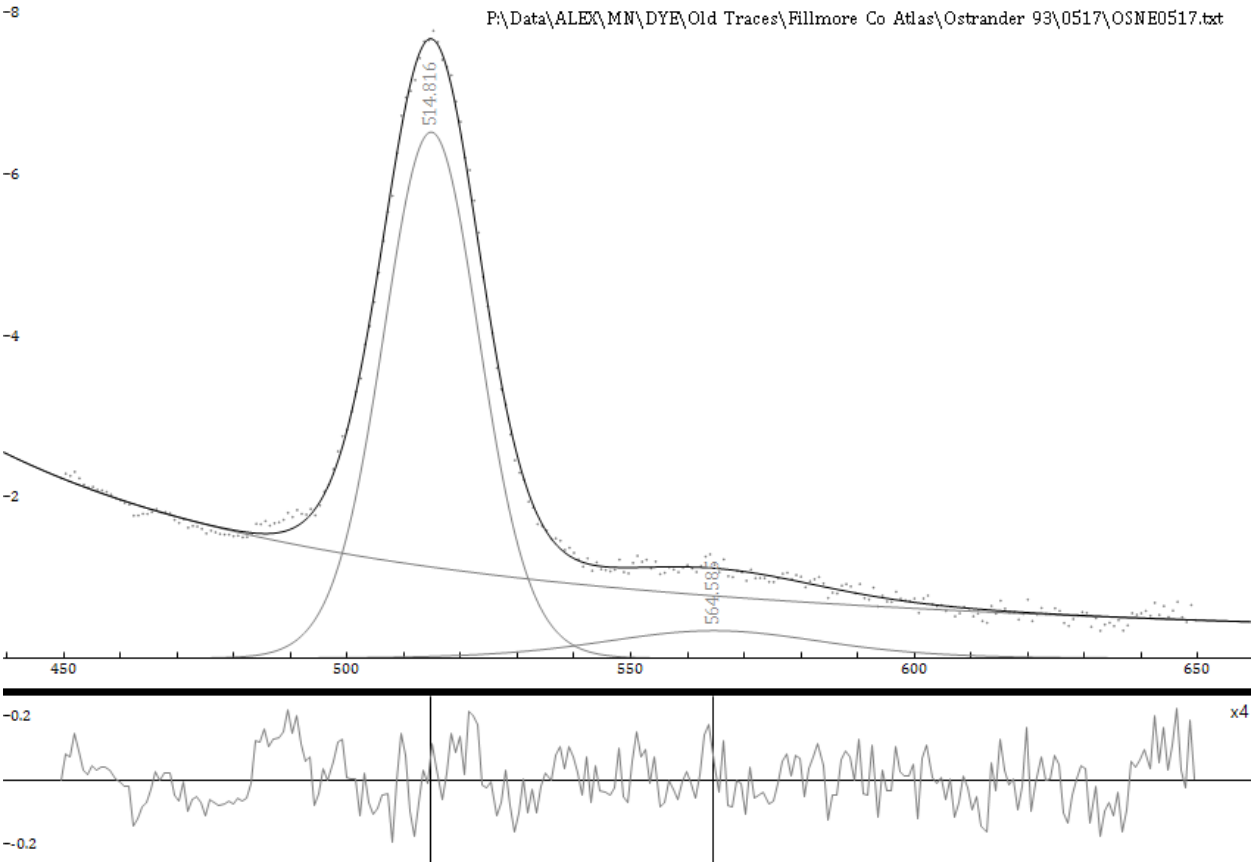
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	83.825	552.167	145936	234.032	552.167 83.825 117.016 3.95744
%_3 Pearson7	514.572	4.27076	132.755	28.5845	4.27076 514.572 14.2923 10
%_4 Pearson7	545.358	1.42657	34.632	22.324	1.42657 545.358 11.162 10
%_5 Pearson7	574.3	1.04749	38.4341	32.9414	1.04749 574.3 16.4707 5



S Branch Root River at Co. Hwy 1 930609

=-> info fit
WSSR=2.54148 DoF=240 WSSR/DoF=0.0105895 SSR=30.702 R2=0.998817
=-> info peaks

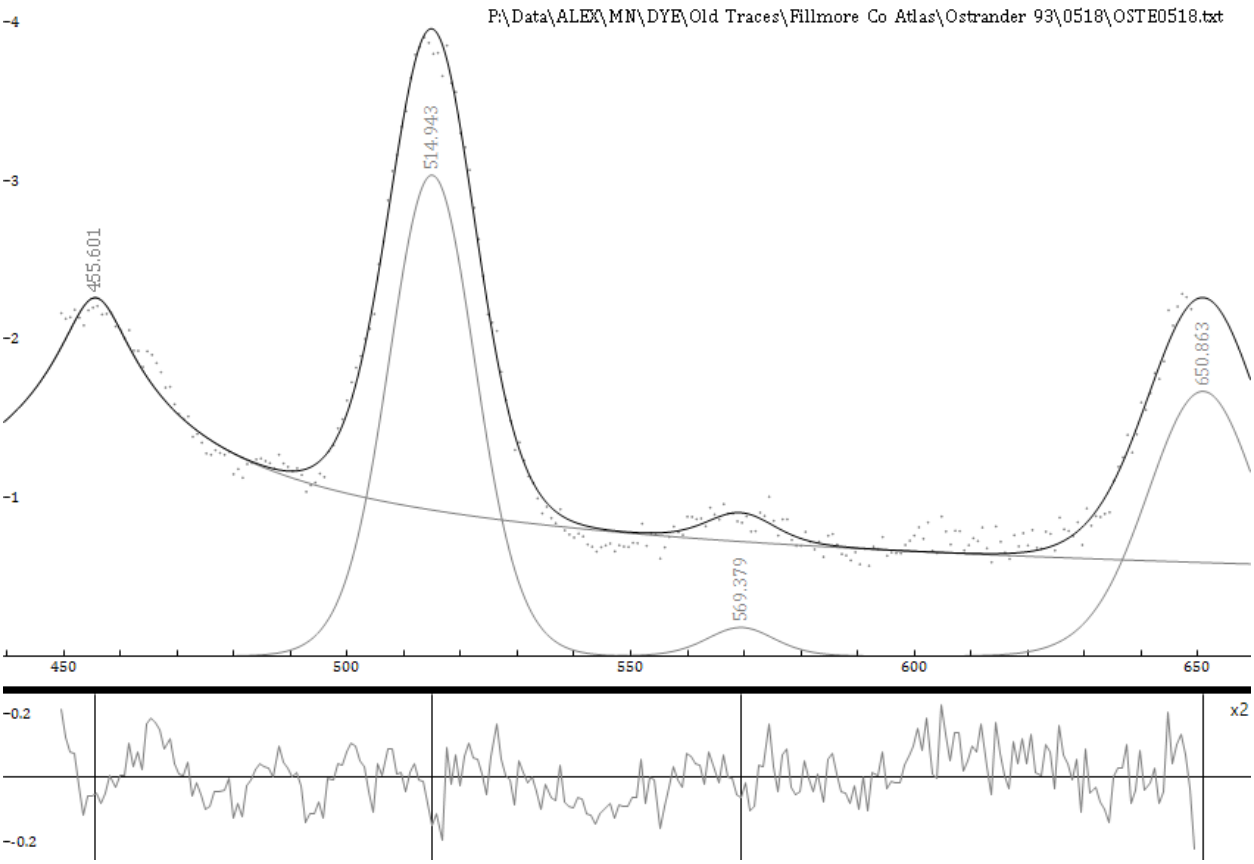
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	443.363	33.3213	2661.69	62.9534	33.3213 443.363 31.4767 1.66314
%_3 Pearson7	507.011	16.7539	1266.81	69.5321	16.7539 507.011 34.766 10
%_4 Pearson7	648.377	2.75082	54.824	18.3272	2.75082 648.377 9.16359 10
%_5 Pearson7	574.3	4.76397	361.865	68.195	4.76397 574.3 34.0975 5



S Branch Root River at 121st Ave 930517

=-> info fit
WSSR=1.22494 DoF=241 WSSR/DoF=0.00508276 SSR=1.79024 R2=0.997639
=-> info peaks

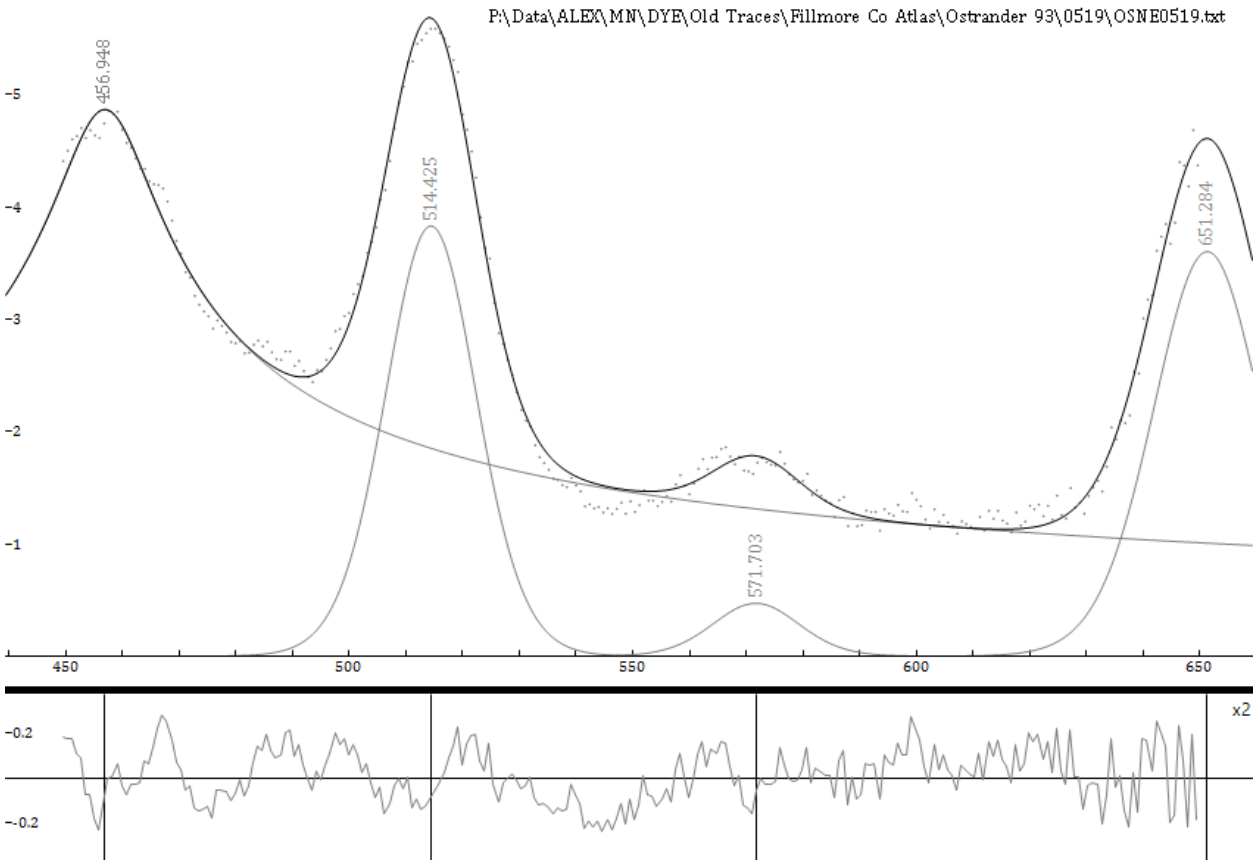
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	347.927	9.19612	2018.61	106.805	9.19612 347.927 53.4024 0.766994
%_3 Pearson7	514.816	6.52153	142.577	20.1042	6.52153 514.816 10.0521 10
%_5 Pearson7	564.585	0.342224	17.4464	45.7689	0.342224 564.585 22.8844 5



S Branch Root River at 121st Ave 930518

=-> info fit
WSSR=1.30161 DoF=238 WSSR/DoF=0.00546897 SSR=1.67992 R2=0.989904
=-> info peaks

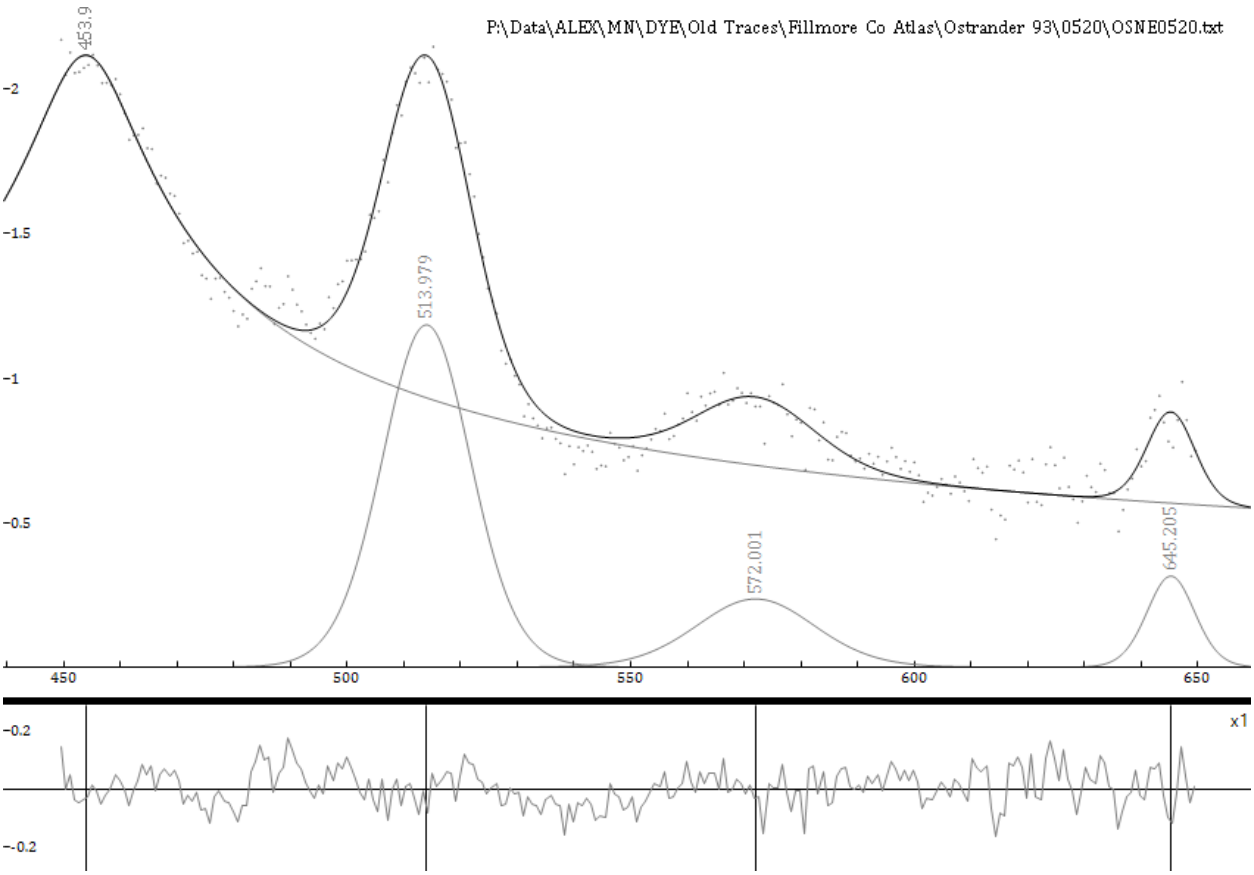
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	455.601	2.26049	x	68.4962	2.26049 455.601 34.2481 0.187481
%_3 Pearson7	514.943	3.03334	59.6752	18.0909	3.03334 514.943 9.04543 10
%_5 Pearson7	569.379	0.181894	2.87302	14.1806	0.181894 569.379 7.0903 5
%_6 Pearson7	650.863	1.67051	42.4307	23.3571	1.67051 650.863 11.6786 10



S Branch Root River at 121st Ave 930519

=-> info fit
WSSR=1.7487 DoF=238 WSSR/DoF=0.00734748 SSR=3.59706 R2=0.991996
=-> info peaks

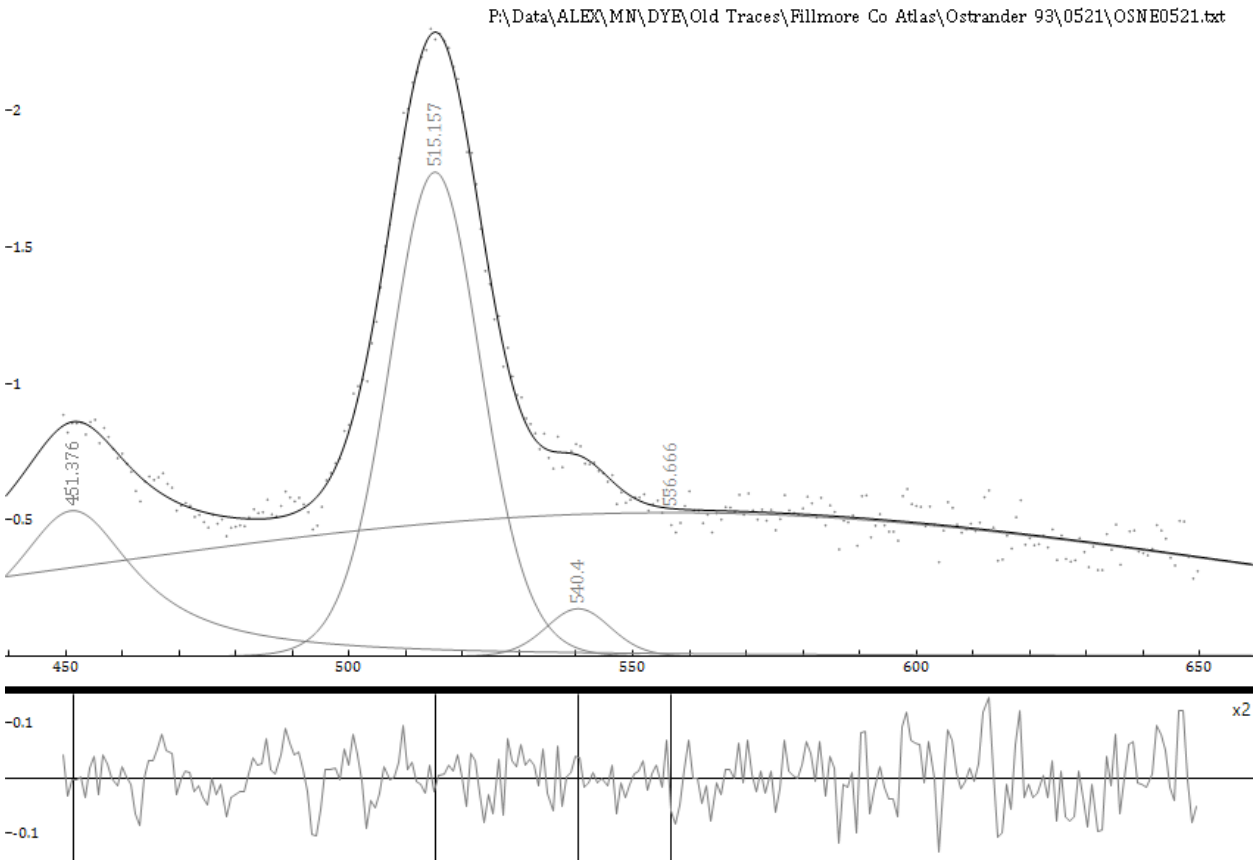
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	456.948	4.86733	x	65.3695	4.86733 456.948 32.6847 0.251795
%_3 Pearson7	514.425	3.83052	79.0907	18.9869	3.83052 514.425 9.49347 10
%_5 Pearson7	571.703	0.471549	9.23418	18.0077	0.471549 571.703 9.00386 10
%_6 Pearson7	651.284	3.60218	88.3267	22.5483	3.60218 651.284 11.2741 10



S Branch Root River at 121st Ave 930520

=-> info fit
WSSR=0.922356 DoF=238 WSSR/DoF=0.00387544 SSR=1.04989 R2=0.981567
=-> info peaks

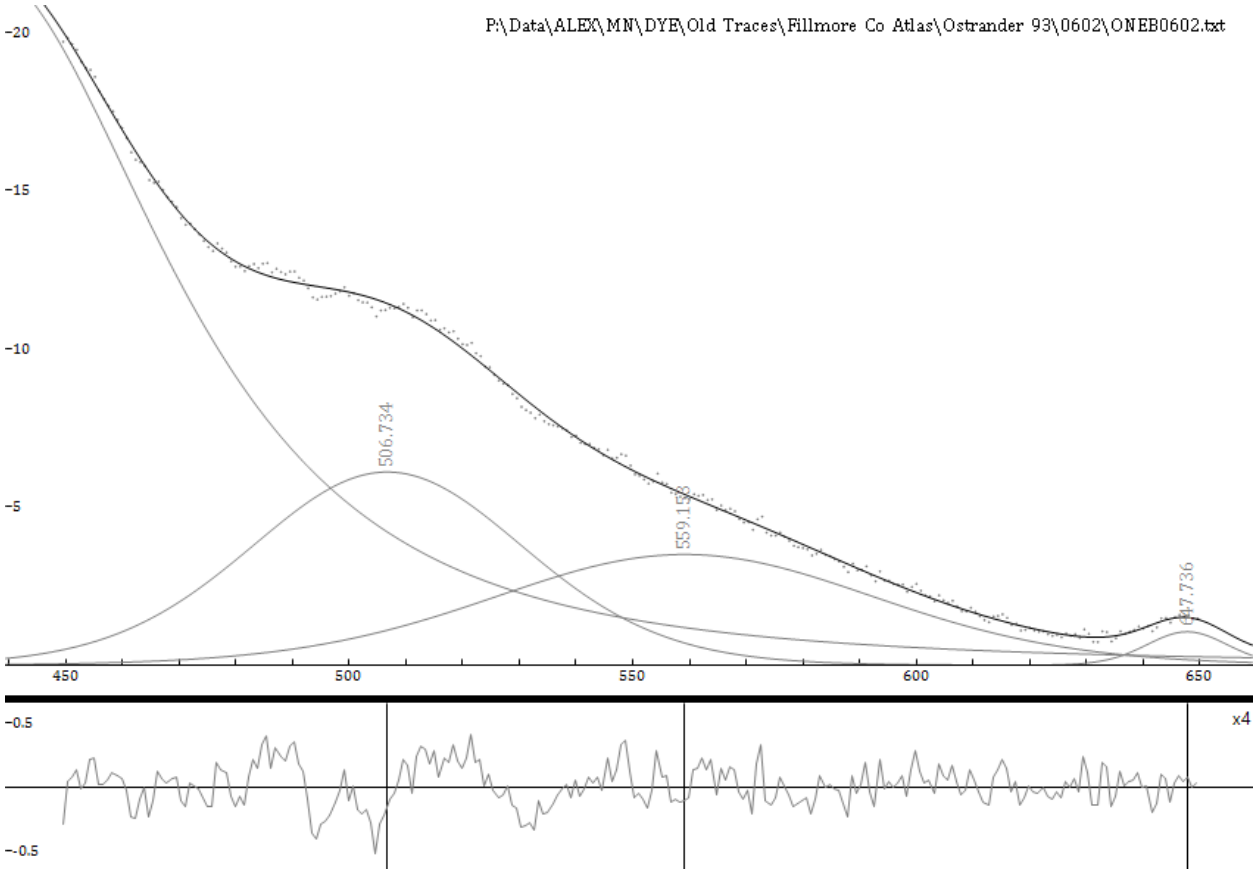
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	453.925	2.11665	x	88.6736	2.11665 453.925 44.3368 0.215808
%_3 Pearson7	513.979	1.18415	23.7503	18.4438	1.18415 513.979 9.22189 10
%_5 Pearson7	572.001	0.236402	6.33766	24.6527	0.236402 572.001 12.3264 10
%_6 Pearson7	645.205	0.315273	3.40915	9.94367	0.315273 645.205 4.97183 10



S Branch Root River at 121st Ave 930521

=-> info fit
WSSR=0.604558 DoF=239 WSSR/DoF=0.00252953 SSR=0.620573 R2=0.987592
=-> info peaks

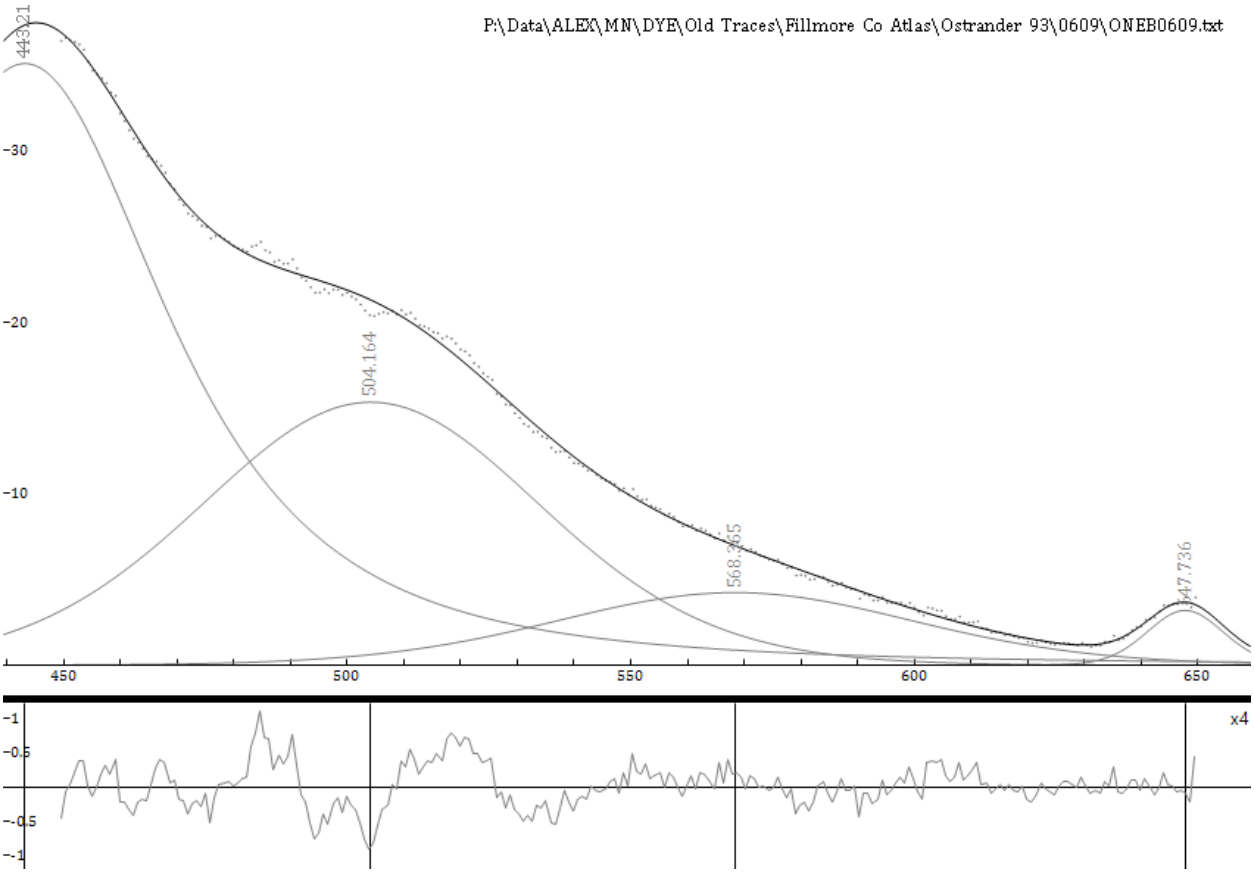
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	451.376	0.533743	23.4677	26.533	0.533743 451.376 13.2665 0.931855
%_3 Pearson7	515.157	1.77441	36.5793	18.9569	1.77441 515.157 9.47846 10
%_5 Pearson7	556.666	0.526377	145.871	254.835	0.526377 556.666 127.418 10
%_7 Pearson7	540.4	0.174425	2.55226	13.4556	0.174425 540.4 6.7278 10



S Branch Root River at 121st Ave 930602

=-> info fit
WSSR=1.23076 DoF=240 WSSR/DoF=0.00512815 SSR=6.44803 R2=0.999075
=-> info peaks

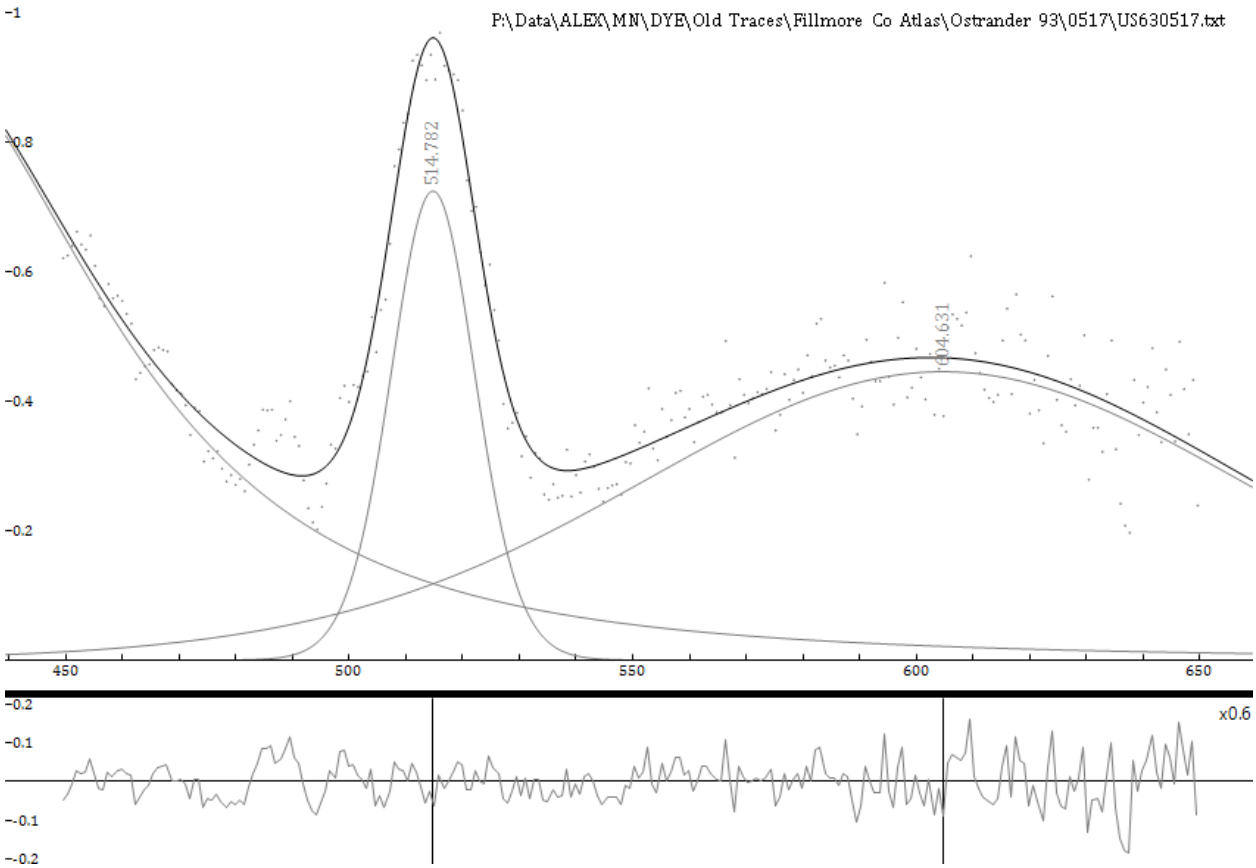
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	434.285	22.1645	2257.01	78.0444	22.1645 434.285 39.0222 1.5
%_3 Pearson7	506.734	6.10645	379.93	57.2139	6.10645 506.734 28.607 10
%_5 Pearson7	559.153	3.50176	306.475	80.4815	3.50176 559.153 40.2407 10
%_8 Pearson7	647.736	1.05908	19.6077	17.0249	1.05908 647.736 8.51247 10



S Branch Root River at 121st Ave 930609

=-> info fit
WSSR=1.98891 DoF=240 WSSR/DoF=0.00828713 SSR=23.4792 R2=0.999118
=-> info peaks

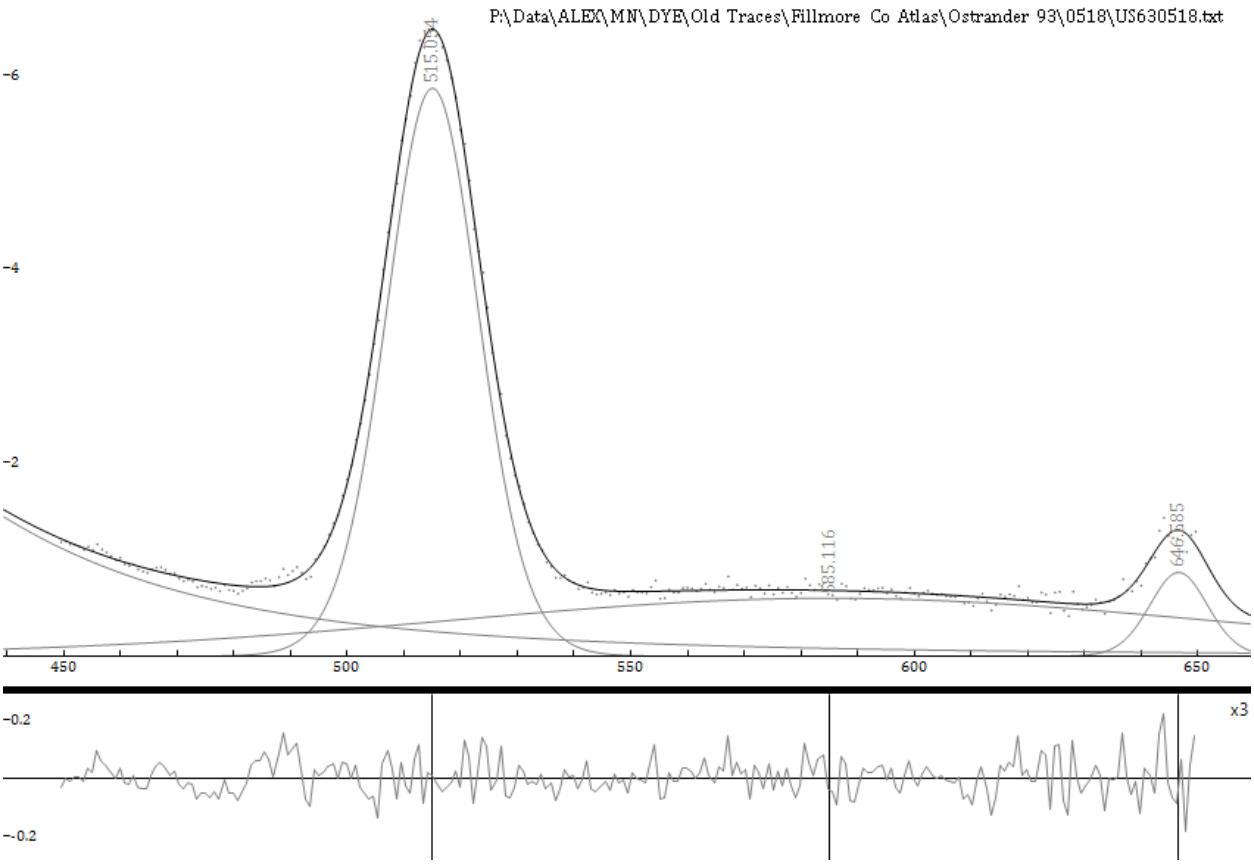
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	443.214	35.0674	2699.15	58.9918	35.0674 443.214 29.4959 1.5
%_3 Pearson7	504.164	15.3338	1182.15	70.8938	15.3338 504.164 35.4469 10
%_5 Pearson7	568.365	4.23709	345.104	74.8979	4.23709 568.365 37.449 10
%_8 Pearson7	647.736	3.19724	55.2711	15.8968	3.19724 647.736 7.94839 10



S Branch Root River at US 63 930517

=-> info fit
WSSR=0.72239 DoF=242 WSSR/DoF=0.00298508 SSR=0.72239 R2=0.879839
=-> info peaks

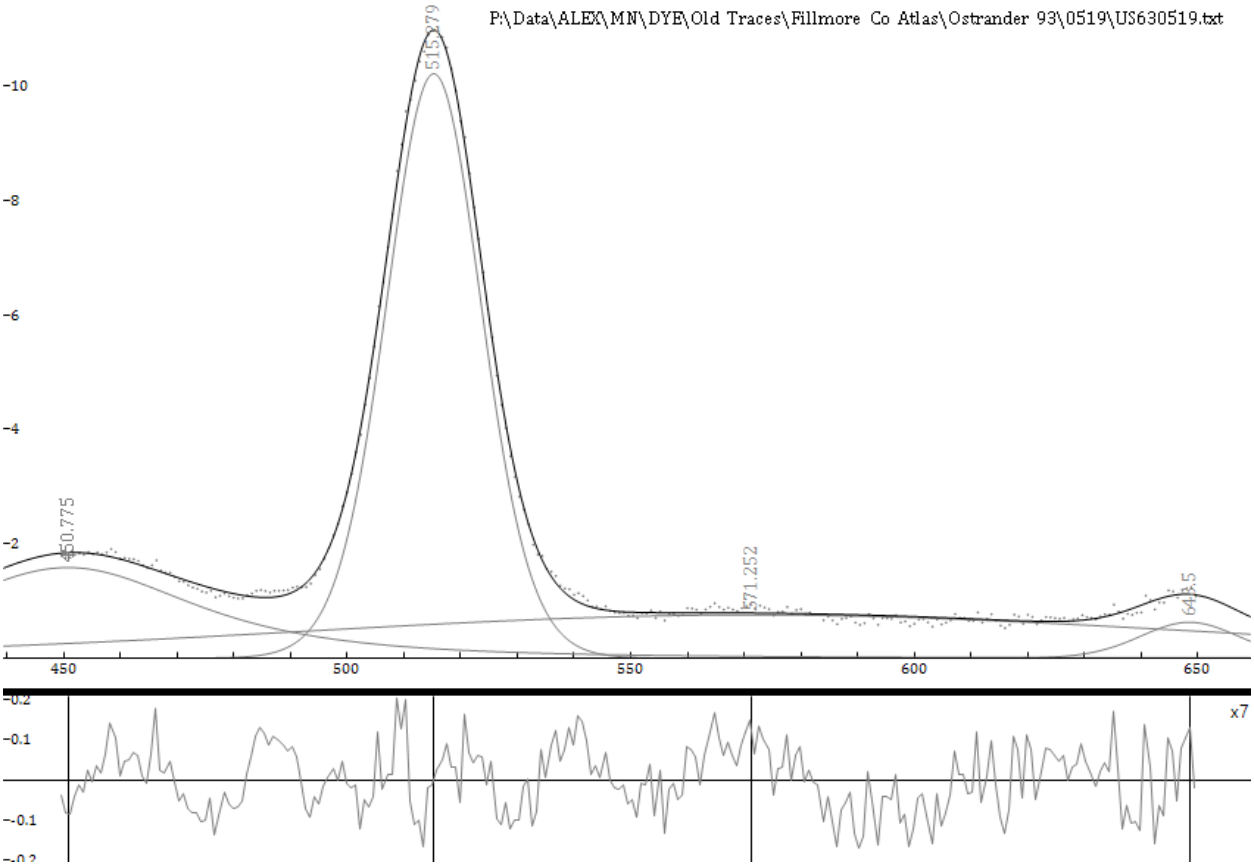
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	420.226	0.969	104.781	82.8759	0.969 420.226 41.4379 1.5
%_3 Pearson7	514.782	0.724587	13.8671	17.5987	0.724587 514.782 8.79936 10
%_5 Pearson7	604.631	0.445638	61.9094	127.75	0.445638 604.631 63.8751 10



S Branch Root River at US 63 930518

=-> info fit
WSSR=0.743213 DoF=239 WSSR/DoF=0.00310968 SSR=0.908244 R2=0.998207
=-> info peaks

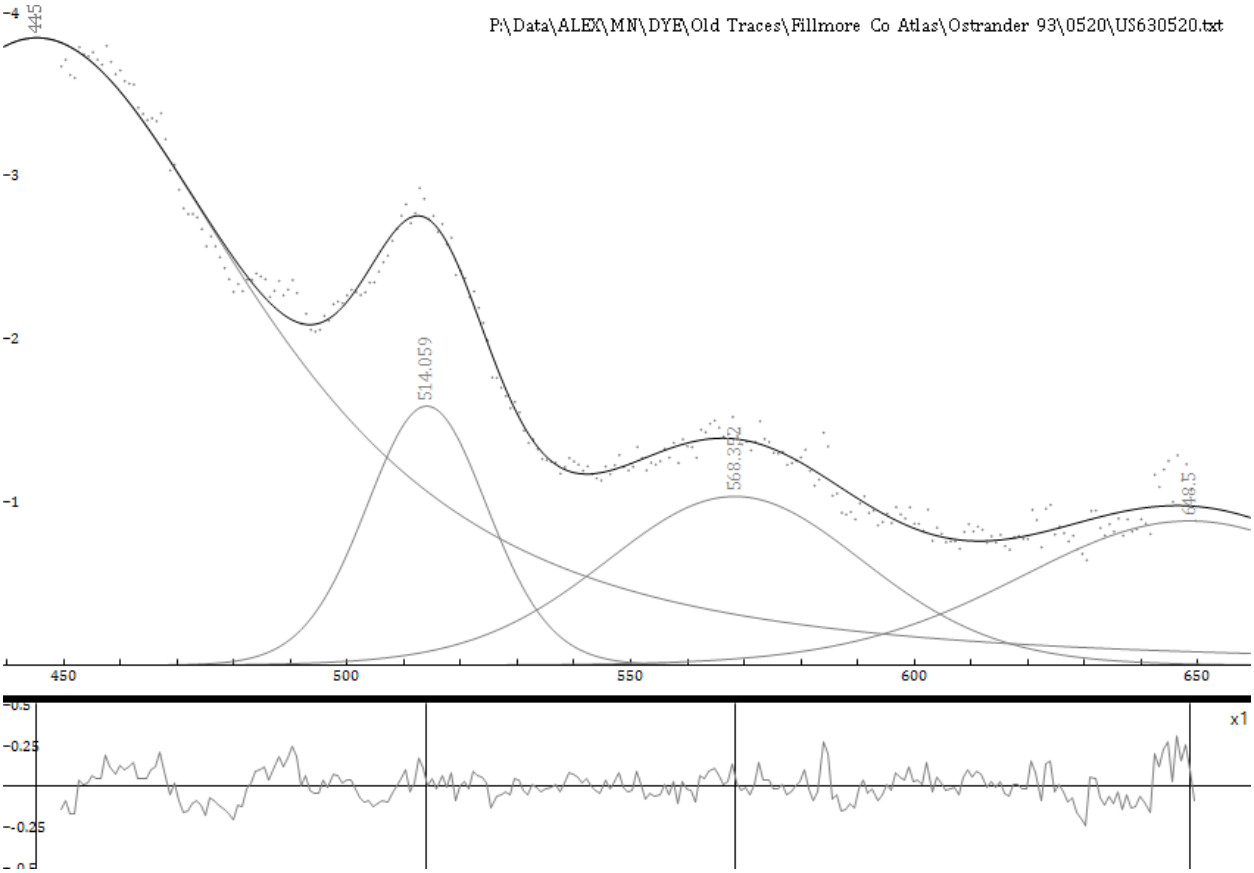
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	387.136	3.37616	403.66	91.6347	3.37616 387.136 45.8174 1.5
%_3 Pearson7	515.054	5.85654	122.345	19.2102	5.85654 515.054 9.60511 10
%_5 Pearson7	585.116	0.59796	105.351	162.014	0.59796 585.116 81.007 10
%_9 Pearson7	646.585	0.864507	11.3703	12.0945	0.864507 646.585 6.04726 10



S Branch Root River at US 63 930519

=-> info fit
WSSR=1.26188 DoF=241 WSSR/DoF=0.005236 SSR=1.64237 R2=0.99897
=-> info peaks

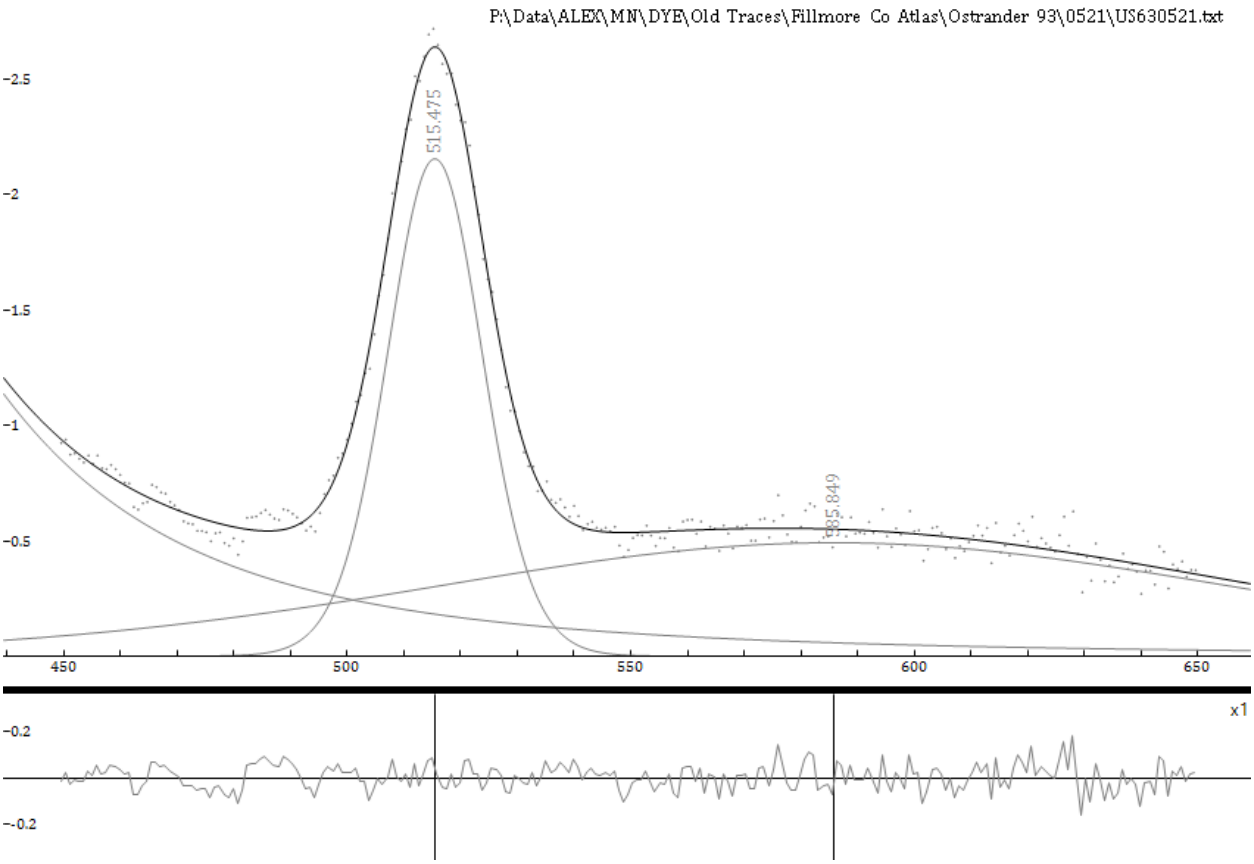
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	450.775	1.58538	110.195	53.2717	1.58538 450.775 26.6358 1.5
%_3 Pearson7	515.279	10.2087	219.306	19.7545	10.2087 515.279 9.87726 10
%_5 Pearson7	571.252	0.757026	158.213	192.185	0.757026 571.252 96.0923 10
%_9 Pearson7	648.5	0.629767	14.1266	20.6274	0.629767 648.5 10.3137 10



S Branch Root River at US 63 930520

=-> info fit
WSSR=1.47076 DoF=241 WSSR/DoF=0.00610273 SSR=2.24462 R2=0.988584
=-> info peaks

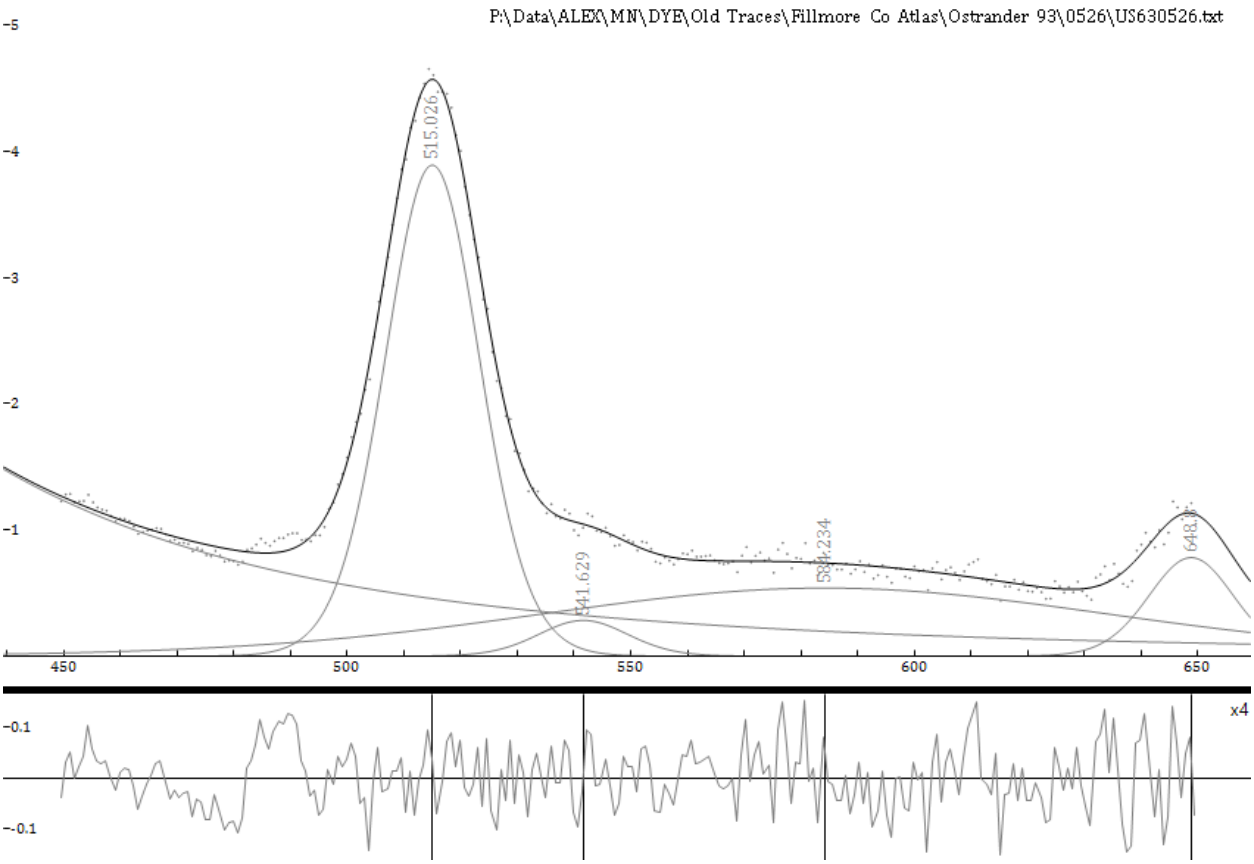
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	445.315	3.84663	454.947	90.646	3.84663 445.315 45.323 1.5
%_3 Pearson7	514.059	1.58861	43.8249	25.3682	1.58861 514.059 12.6841 10
%_5 Pearson7	568.352	1.03507	61.2825	54.4446	1.03507 568.352 27.2223 10
%_9 Pearson7	648.5	0.884951	68.5621	71.2446	0.884951 648.5 35.6223 10



S Branch Root River at US 63 930521

=-> info fit
WSSR=0.71331 DoF=242 WSSR/DoF=0.00294756 SSR=0.745636 R2=0.98958
=-> info peaks

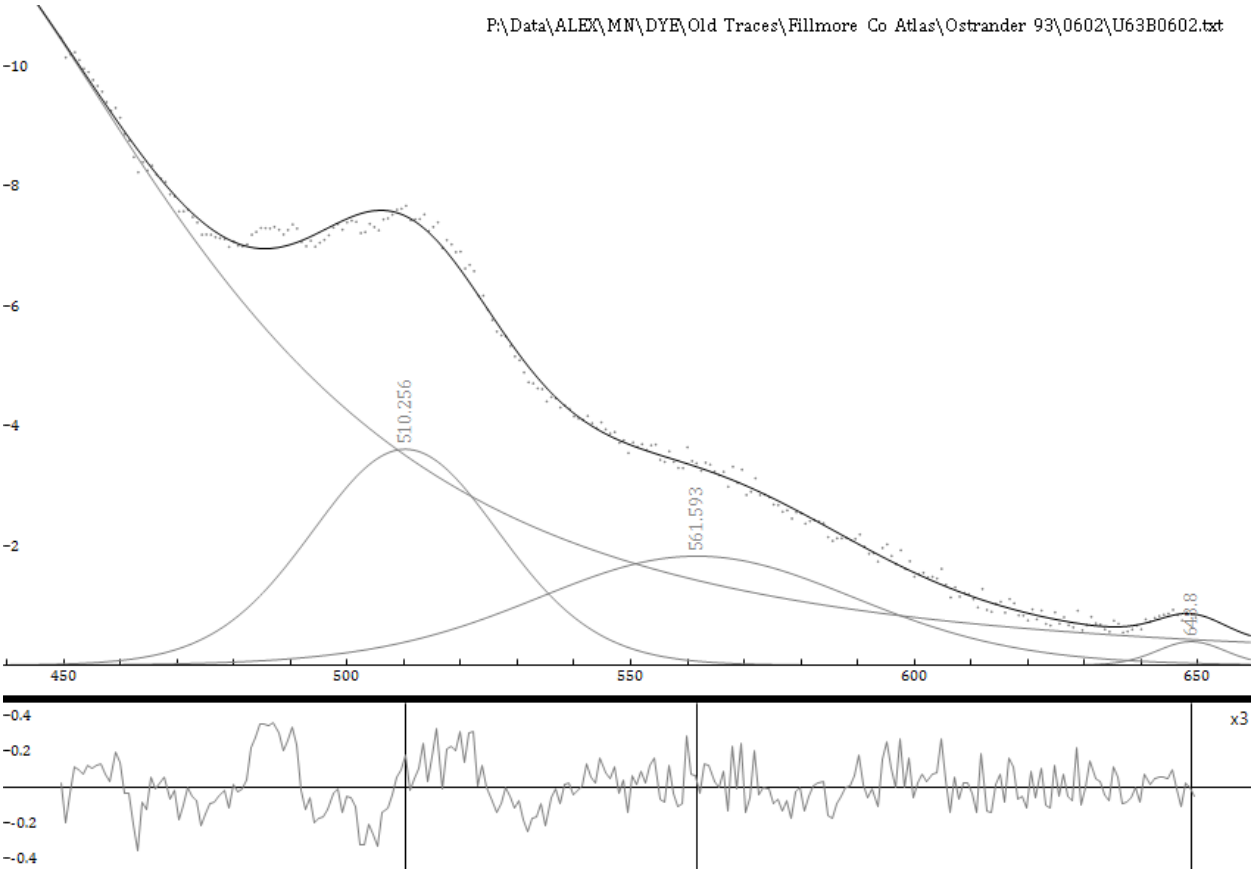
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	378.021	4.40432	446.929	77.7726	4.40432 378.021 38.8863 1.5
%_3 Pearson7	515.475	2.15545	46.485	19.8318	2.15545 515.475 9.91588 10
%_5 Pearson7	585.849	0.492092	90.2379	168.628	0.492092 585.849 84.3141 10



S Branch Root River at US 63 930526

=-> info fit
WSSR=0.885349 DoF=238 WSSR/DoF=0.00371996 SSR=0.982157 R2=0.99568
=-> info peaks

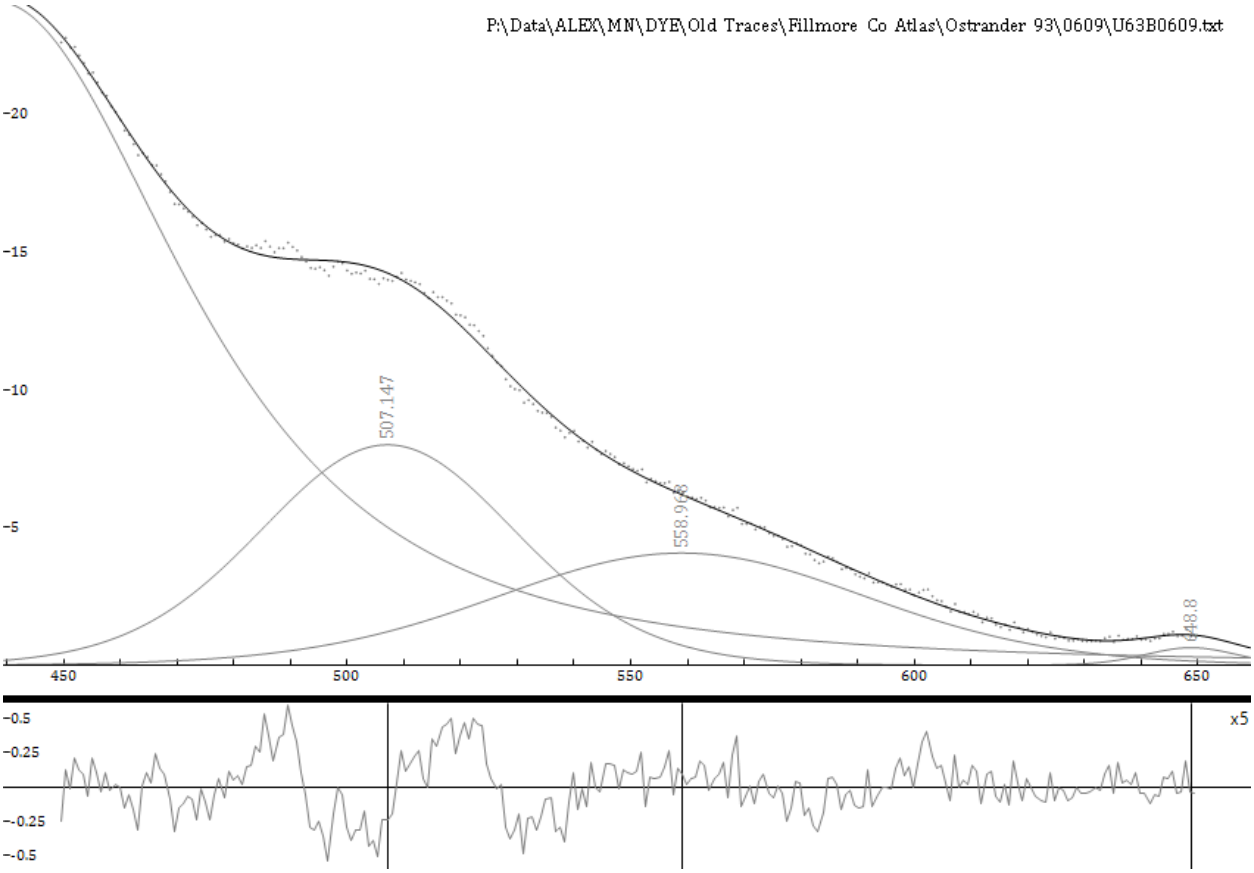
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	330.385	6.79088	1116.71	126.033	6.79088 330.385 63.0163 1.5
%_3 Pearson7	515.026	3.88928	83.2364	19.6803	3.88928 515.026 9.84014 10
%_10 Pearson7	648.8	0.781731	15.1714	17.8466	0.781731 648.8 8.92329 10
%_11 Pearson7	584.234	0.540577	71.0689	120.895	0.540577 584.234 60.4477 10
%_13 Pearson7	541.629	0.284508	5.79342	18.7252	0.284508 541.629 9.36262 10



S Branch Root River at US 63 930602

=-> info fit
WSSR=1.2803 DoF=240 WSSR/DoF=0.00533459 SSR=4.5885 R2=0.997826
=-> info peaks

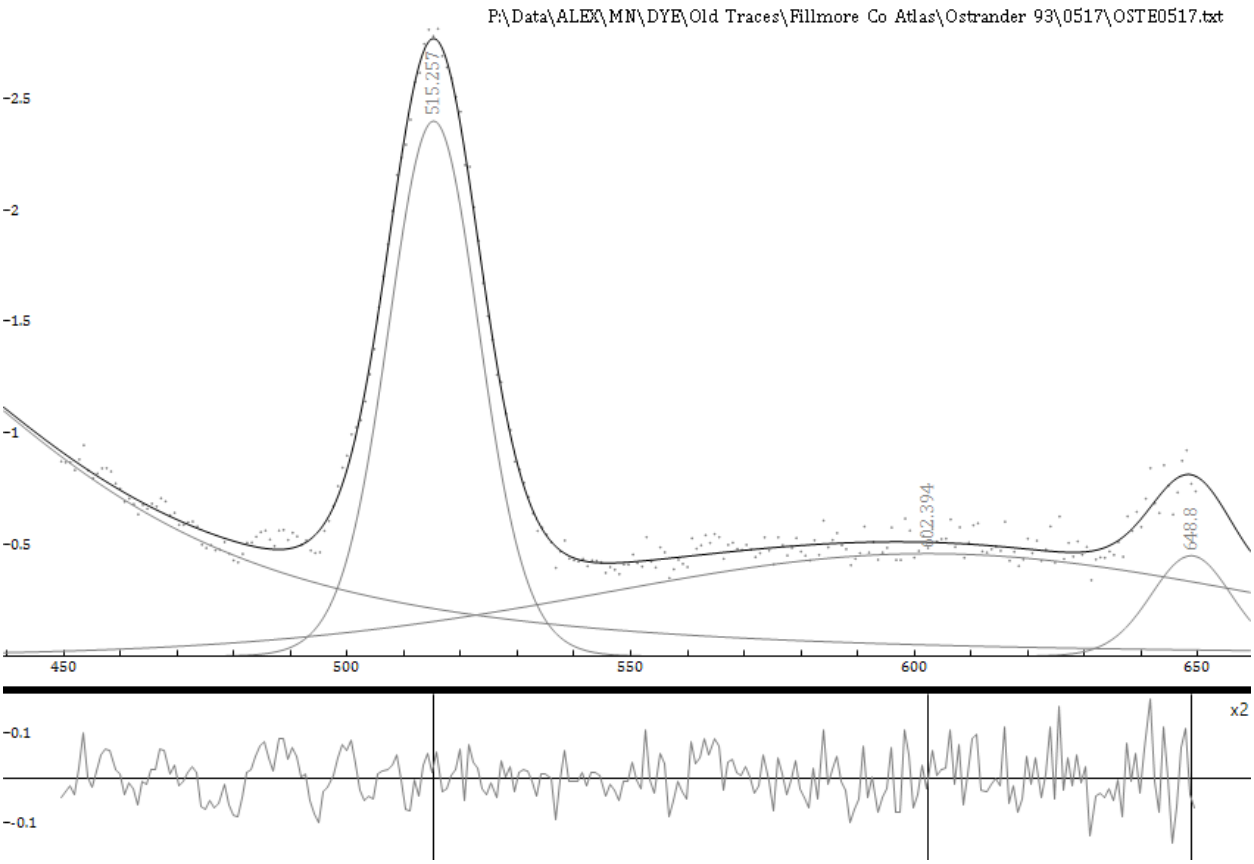
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	416.799	13.3229	2078.63	119.576	13.3229 416.799 59.7881 1.5
%_3 Pearson7	510.256	3.60641	155.254	39.5871	3.60641 510.256 19.7936 10
%_5 Pearson7	561.593	1.8223	133.389	67.3114	1.8223 561.593 33.6557 10
%_10 Pearson7	648.8	0.395545	6.17736	14.3613	0.395545 648.8 7.18065 10



S Branch Root River at US 63 930609

=-> info fit
WSSR=1.39275 DoF=240 WSSR/DoF=0.00580311 SSR=10.0667 R2=0.999014
=-> info peaks

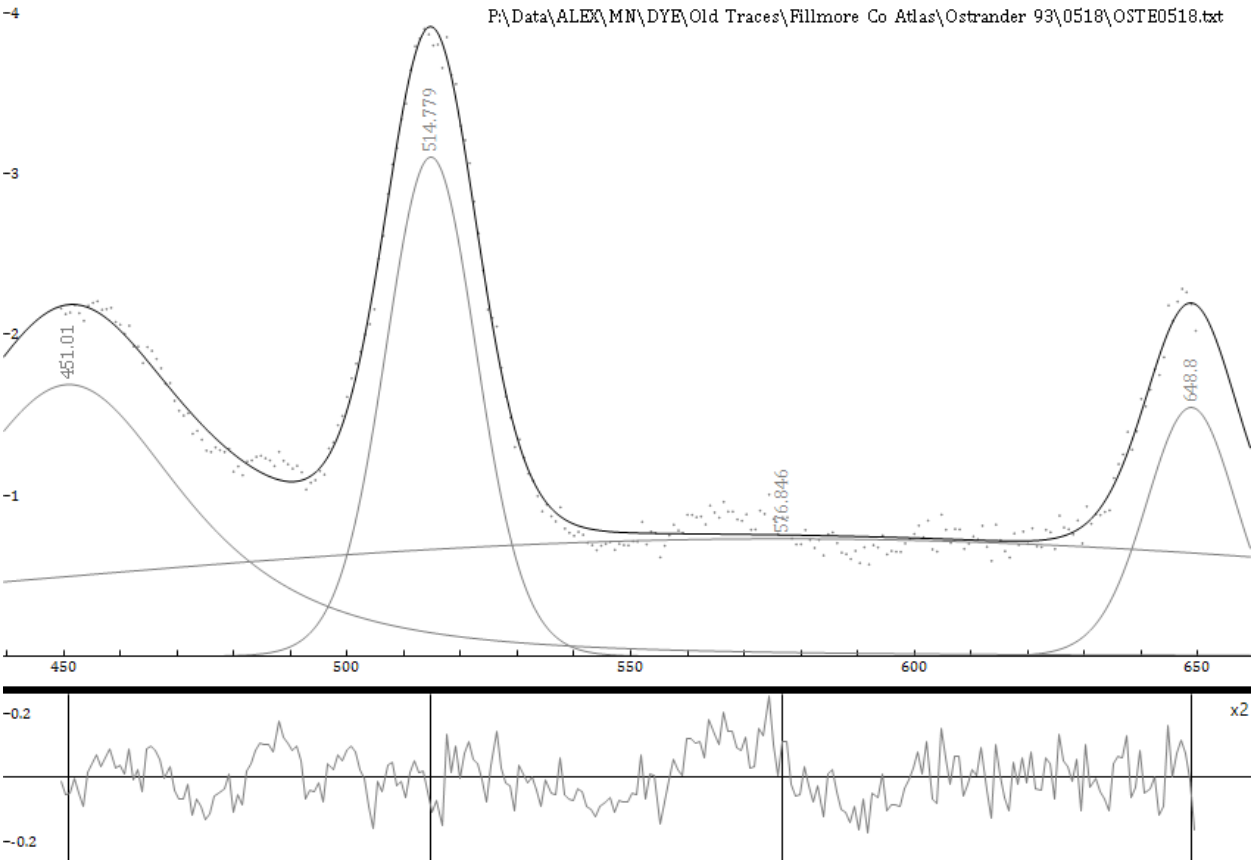
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	438.186	24.0706	2441.6	77.7419	24.0706 438.186 38.871 1.5
%_3 Pearson7	507.147	7.99752	464.128	53.3665	7.99752 507.147 26.6833 10
%_5 Pearson7	558.968	4.07147	343.717	77.6313	4.07147 558.968 38.8156 10
%_10 Pearson7	648.8	0.639354	13.4025	19.2766	0.639354 648.8 9.63831 10



S Branch Root River at 180th St 930517

=-> info fit
WSSR=0.660963 DoF=240 WSSR/DoF=0.00275401 SSR=0.686301 R2=0.991048
=-> info peaks

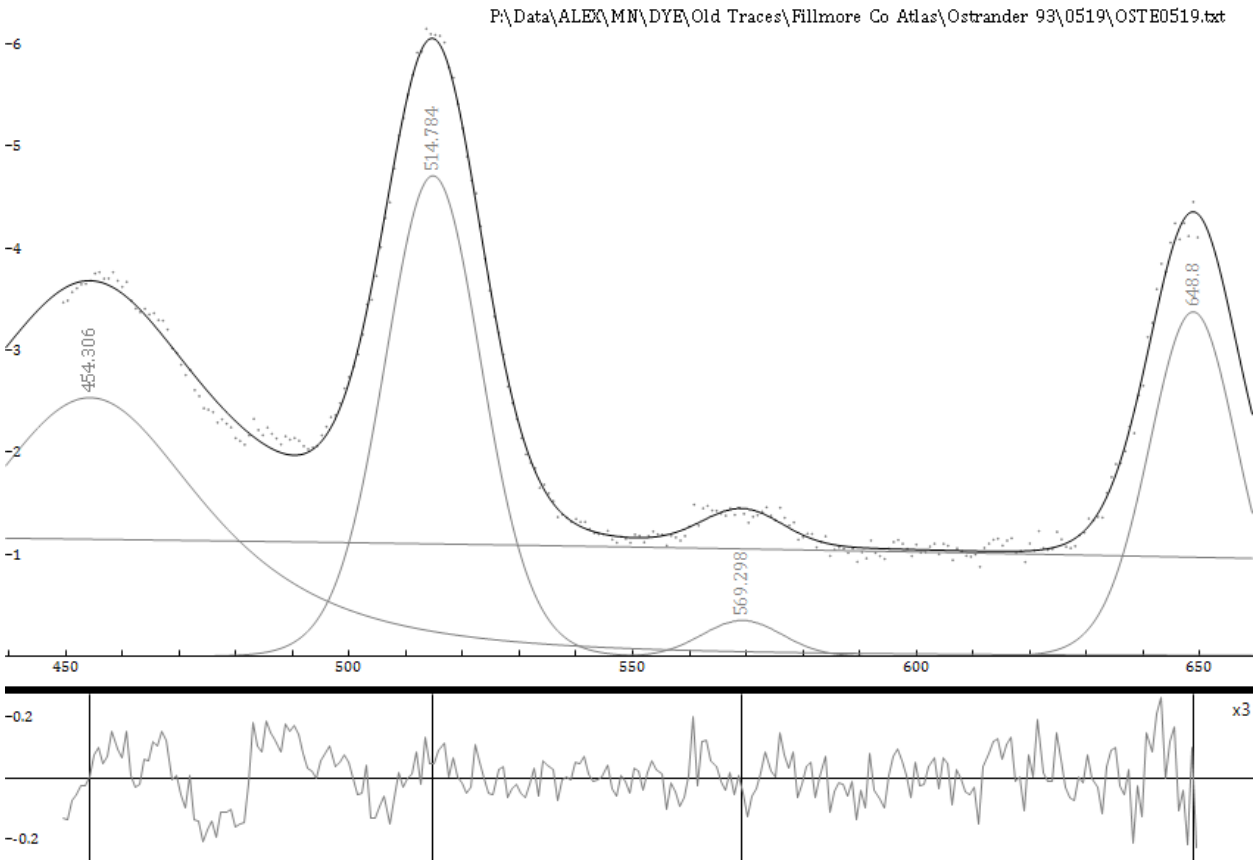
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	403.457	1.6242	214.625	101.276	1.6242 403.457 50.6382 1.5
%_3 Pearson7	515.257	2.39727	49.5467	19.0057	2.39727 515.257 9.50286 10
%_5 Pearson7	602.394	0.459931	69.1369	138.23	0.459931 602.394 69.1152 10
%_10 Pearson7	648.8	0.450383	8.26952	16.8844	0.450383 648.8 8.4422 10



S Branch Root River at 180th St 930518

=-> info fit
WSSR=1.32151 DoF=240 WSSR/DoF=0.00550629 SSR=1.59166 R2=0.990435
=-> info peaks

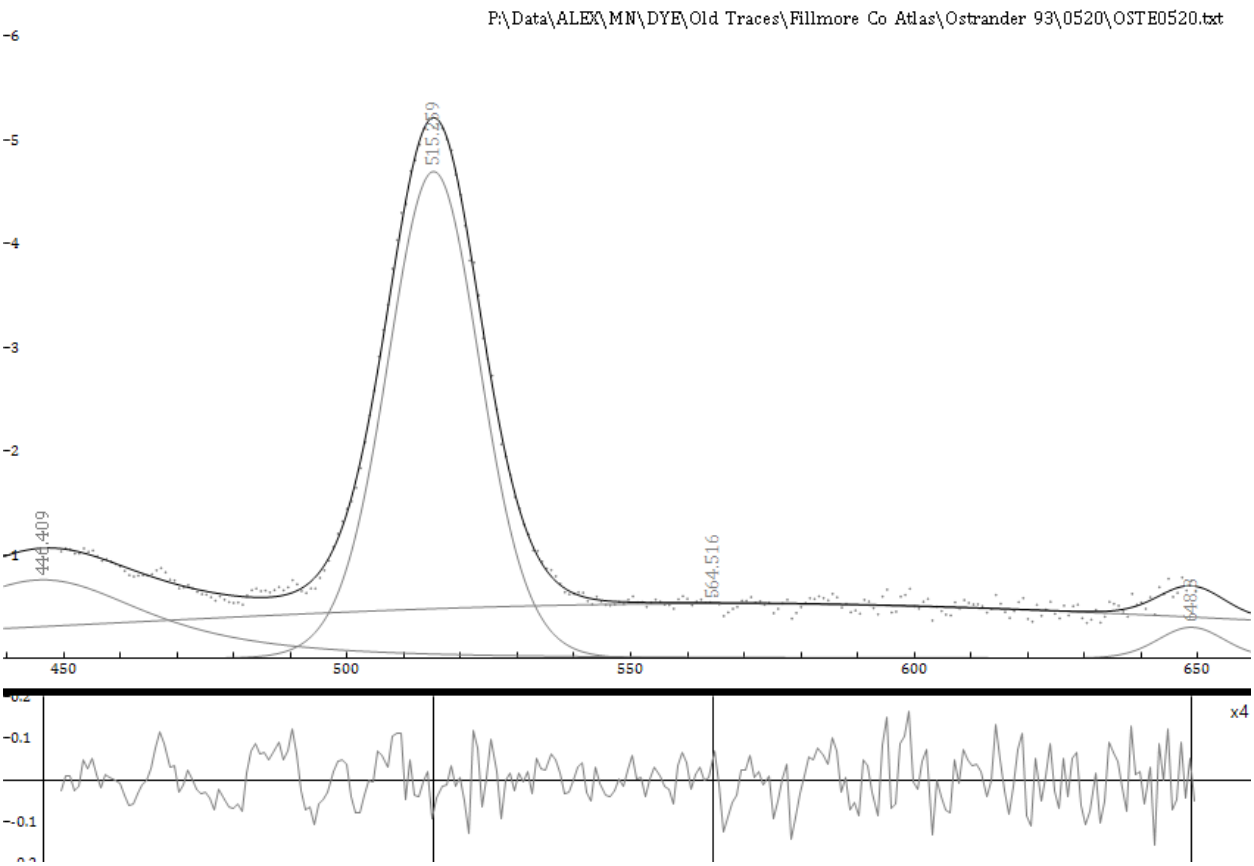
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	451.01	1.68966	106.474	48.296	1.68966 451.01 24.148 1.5
%_3 Pearson7	514.779	3.10421	64.369	19.0683	3.10421 514.779 9.53415 10
%_5 Pearson7	576.846	0.730432	270.495	340.539	0.730432 576.846 170.269 10
%_10 Pearson7	648.8	1.54758	31.8576	18.9298	1.54758 648.8 9.46492 10



S Branch Root River at 180th St 930519

=-> info fit
WSSR=0.944271 DoF=237 WSSR/DoF=0.00398427 SSR=1.89831 R2=0.995886
=-> info peaks

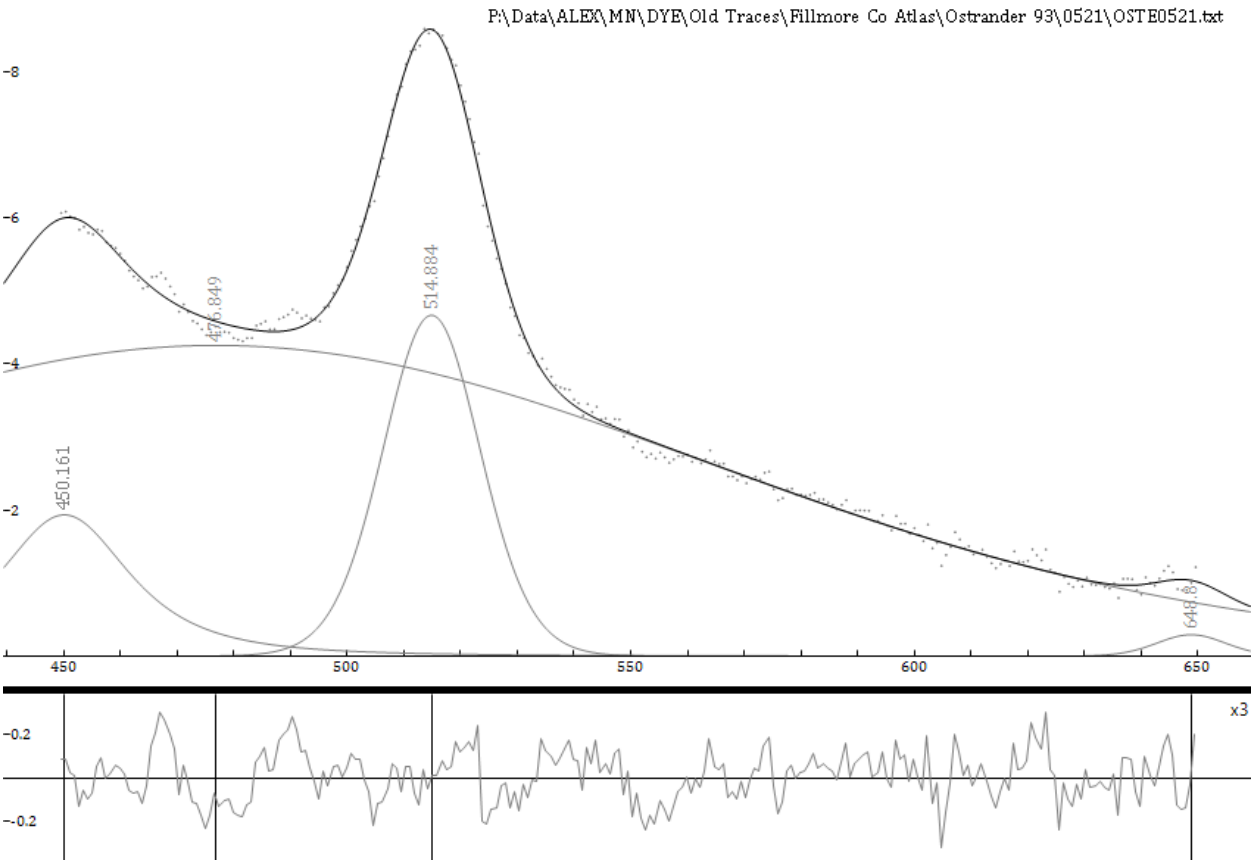
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	454.27	2.53676	158.808	47.9799	2.53676 454.27 23.9899 1.5
%_3 Pearson7	514.787	4.71145	103.4	20.1815	4.71145 514.787 10.0907 10
%_5 Pearson7	133.903	1.26915	2326.03	1685.34	1.26915 133.903 842.671 10
%_10 Pearson7	648.8	3.37378	67.5995	18.4252	3.37378 648.8 9.21262 10
%_11 Pearson7	569.272	0.355744	6.39547	16.5319	0.355744 569.272 8.26594 10



S Branch Root River at 180th St 930521

=-> info fit
WSSR=0.786922 DoF=240 WSSR/DoF=0.00327884 SSR=0.887818 R2=0.997327
=-> info peaks

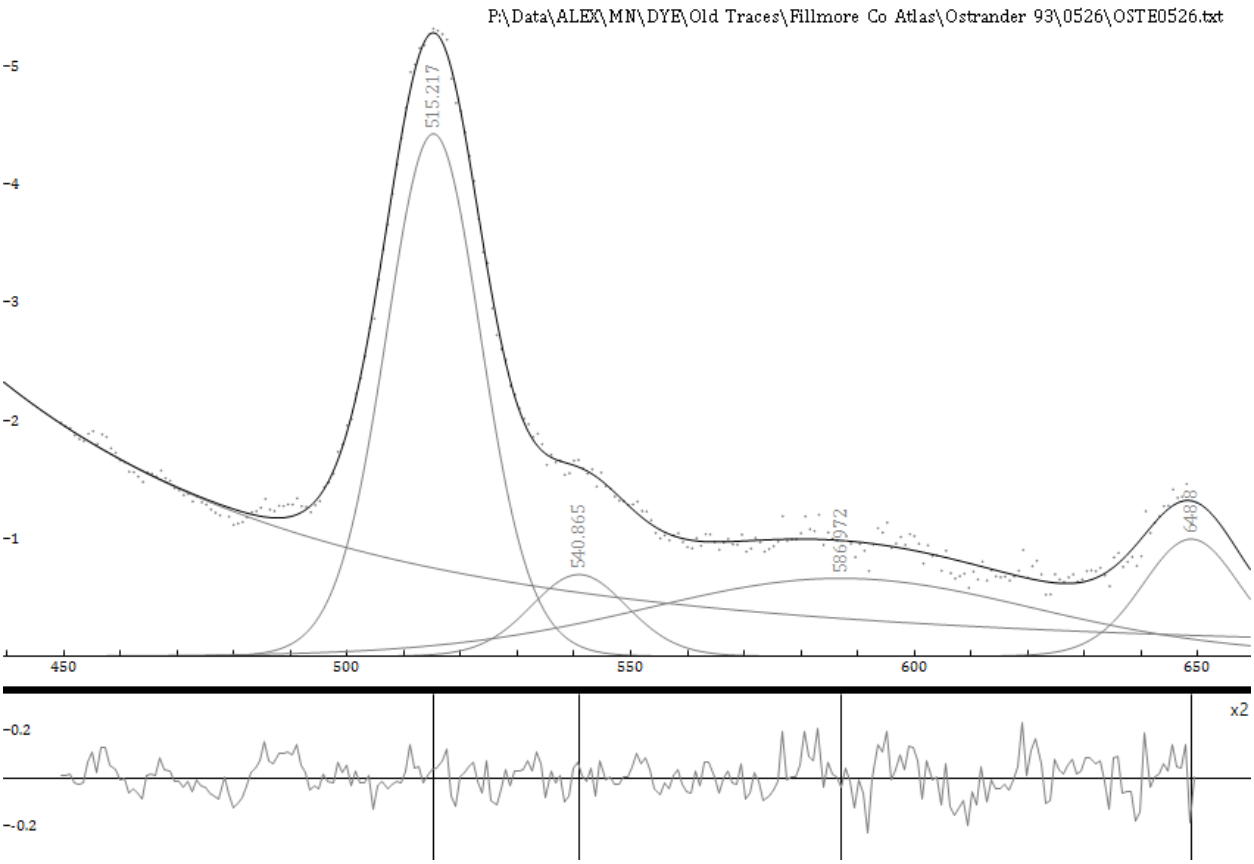
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	446.409	0.757287	42.7301	43.2455	0.757287 446.409 21.6228 1.5
%_3 Pearson7	515.259	4.69686	97.9313	19.1735	4.69686 515.259 9.58673 10
%_10 Pearson7	648.8	0.299599	4.48856	13.7769	0.299599 648.8 6.88847 10
%_11 Pearson7	564.516	0.526853	153.691	268.254	0.526853 564.516 134.127 10



S Branch Root River at 180th St 930521

=-> info fit
WSSR=1.3132 DoF=240 WSSR/DoF=0.00547168 SSR=3.21735 R2=0.997059
=-> info peaks

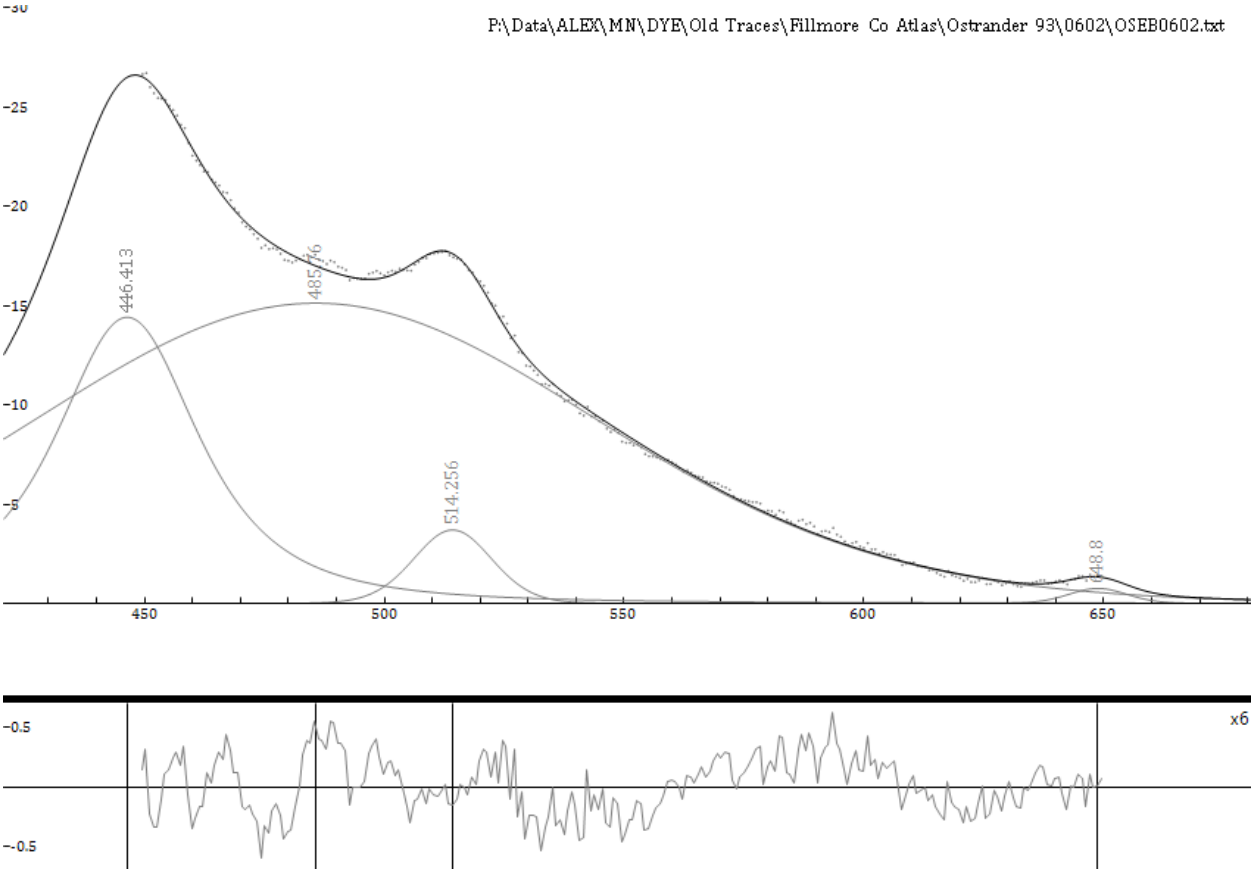
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	450.161	1.93572	68.4202	27.09	1.93572 450.161 13.545 1.5
%_3 Pearson7	514.884	4.6665	102.869	20.2713	4.6665 514.884 10.1357 10
%_10 Pearson7	648.8	0.295644	4.64675	14.4533	0.295644 648.8 7.22666 10
%_11 Pearson7	476.849	4.25451	975.936	210.94	4.25451 476.849 105.47 10



S Branch Root River at 180th St 930526

=-> info fit
WSSR=1.21337 DoF=237 WSSR/DoF=0.0051197 SSR=1.47179 R2=0.995023
=-> info peaks

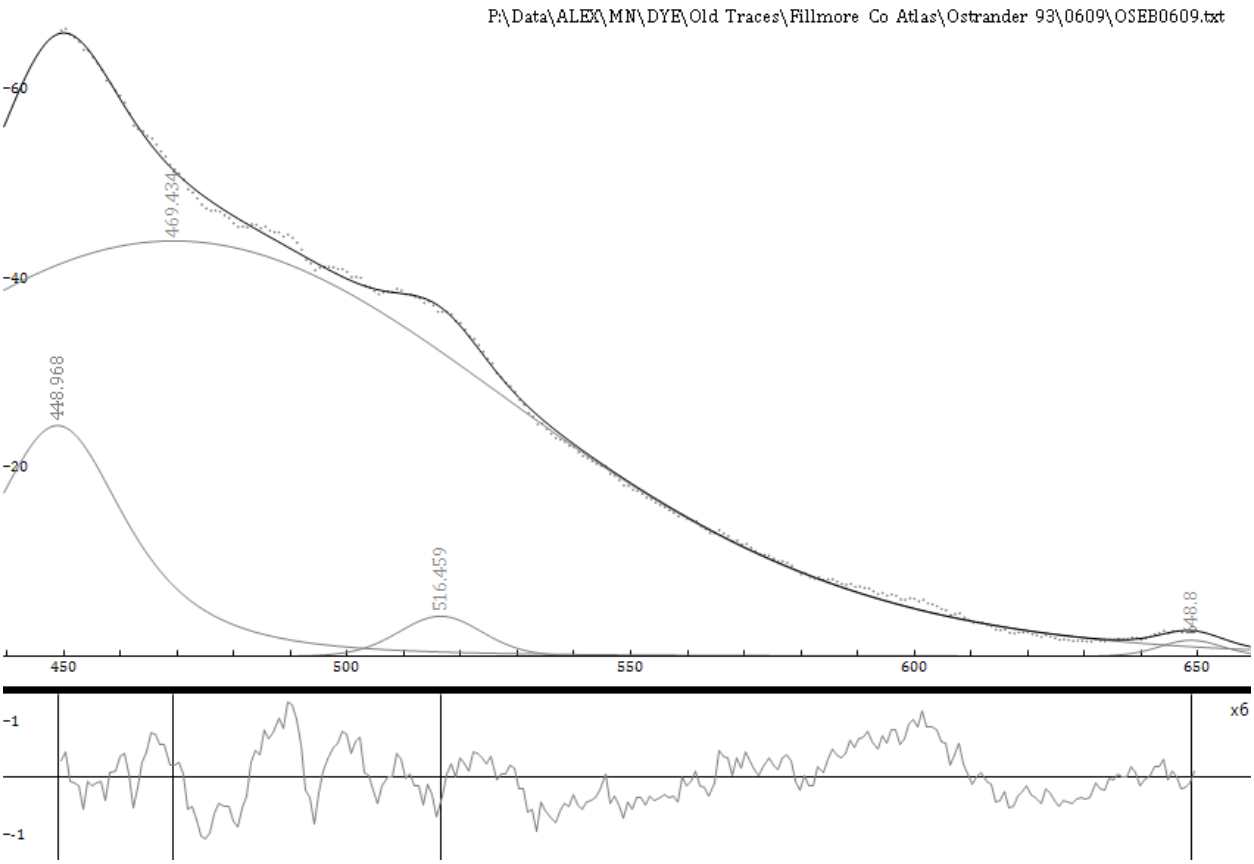
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	332.256	8.83612	1580.49	137.087	8.83612 332.256 68.5435 1.5
%_3 Pearson7	515.217	4.42639	95.9311	19.9295	4.42639 515.217 9.96476 10
%_10 Pearson7	648.8	0.992957	22.0466	20.4172	0.992957 648.8 10.2086 10
%_11 Pearson7	586.972	0.660317	59.1179	82.3291	0.660317 586.972 41.1646 10
%_12 Pearson7	540.865	0.692523	15.2006	20.1844	0.692523 540.865 10.0922 10



S Branch Root River at 180th St 930602

=-> info fit
WSSR=2.45272 DoF=240 WSSR/DoF=0.0102197 SSR=13.941 R2=0.999021
=-> info peaks

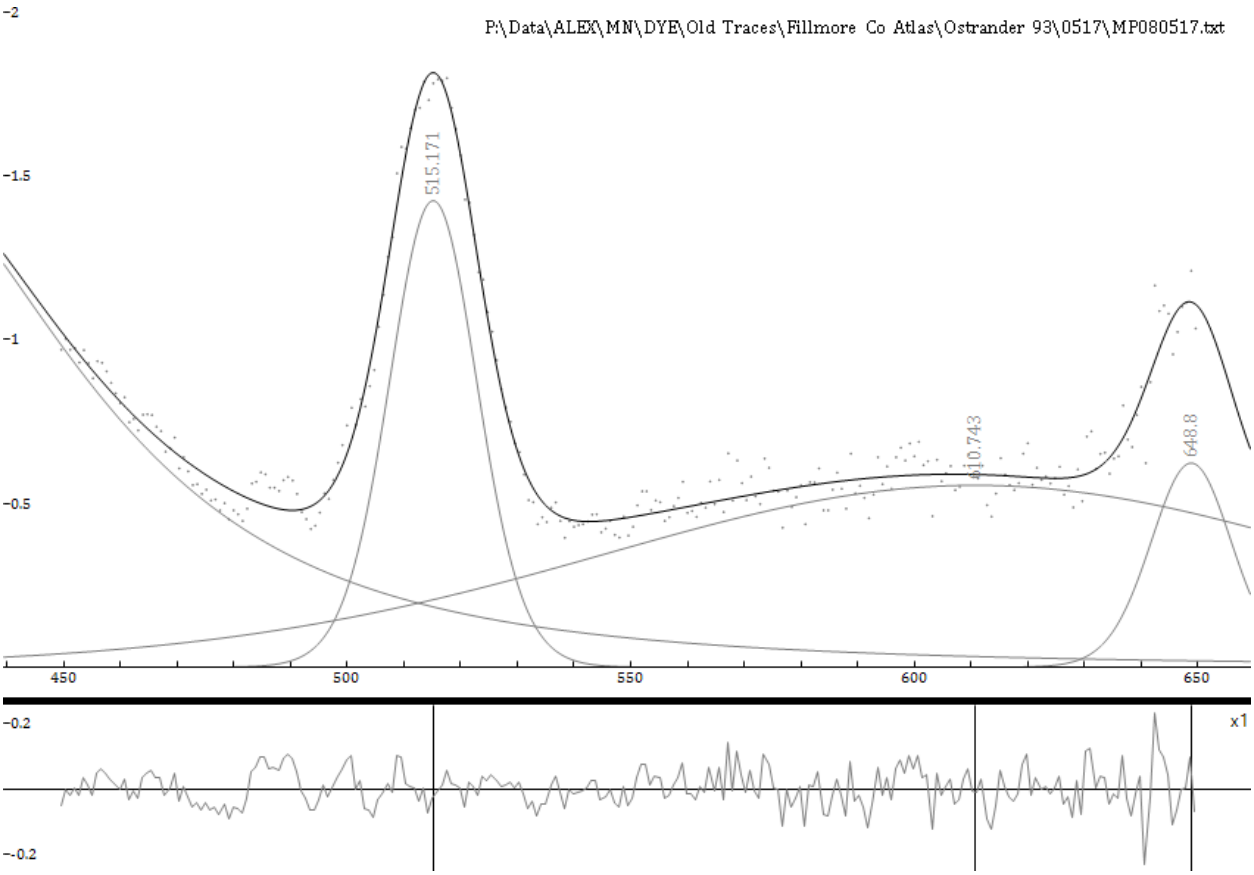
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	446.413	14.4138	661.453	35.1711	14.4138 446.413 17.5856 1.5
%_3 Pearson7	514.256	3.70191	77.4816	19.2468	3.70191 514.256 9.62342 10
%_10 Pearson7	648.8	0.759025	11.8899	14.4049	0.759025 648.8 7.20245 10
%_11 Pearson7	485.76	15.1241	2302.32	139.986	15.1241 485.76 69.9929 10



S Branch Root River at 180th St 930609

=-> info fit
WSSR=5.41305 DoF=240 WSSR/DoF=0.0225544 SSR=54.9391 R2=0.999424
=-> info peaks

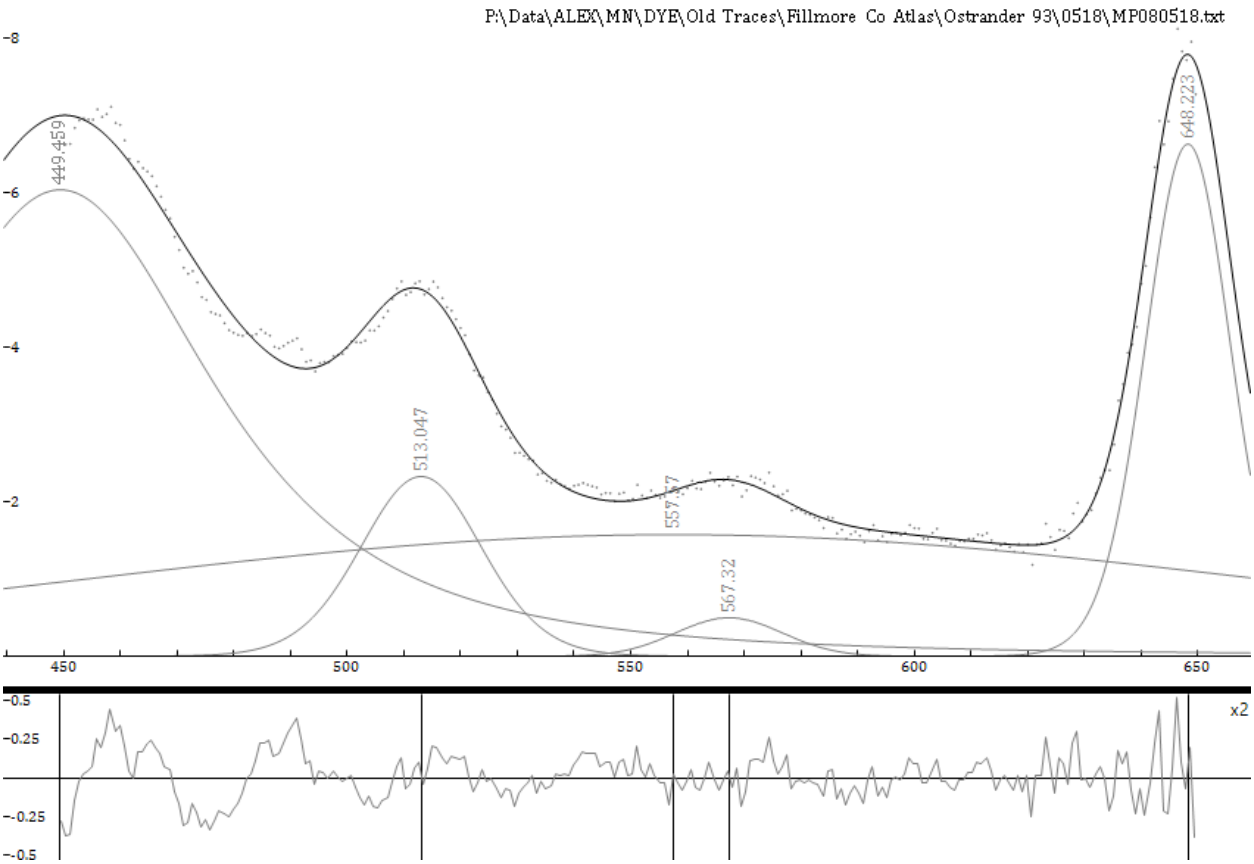
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	448.968	24.3681	908.45	28.5724	24.3681 448.968 14.2862 1.5
%_3 Pearson7	516.459	4.23118	79.9223	17.3697	4.23118 516.459 8.68487 10
%_10 Pearson7	648.8	1.68964	24.0271	13.0766	1.68964 648.8 6.53829 10
%_11 Pearson7	469.434	43.8683	6780.47	142.133	43.8683 469.434 71.0667 10



US 63 – Mile Post 8 930517

=-> info fit
WSSR=0.785475 DoF=240 WSSR/DoF=0.00327281 SSR=0.810299 R2=0.968552
=-> info peaks

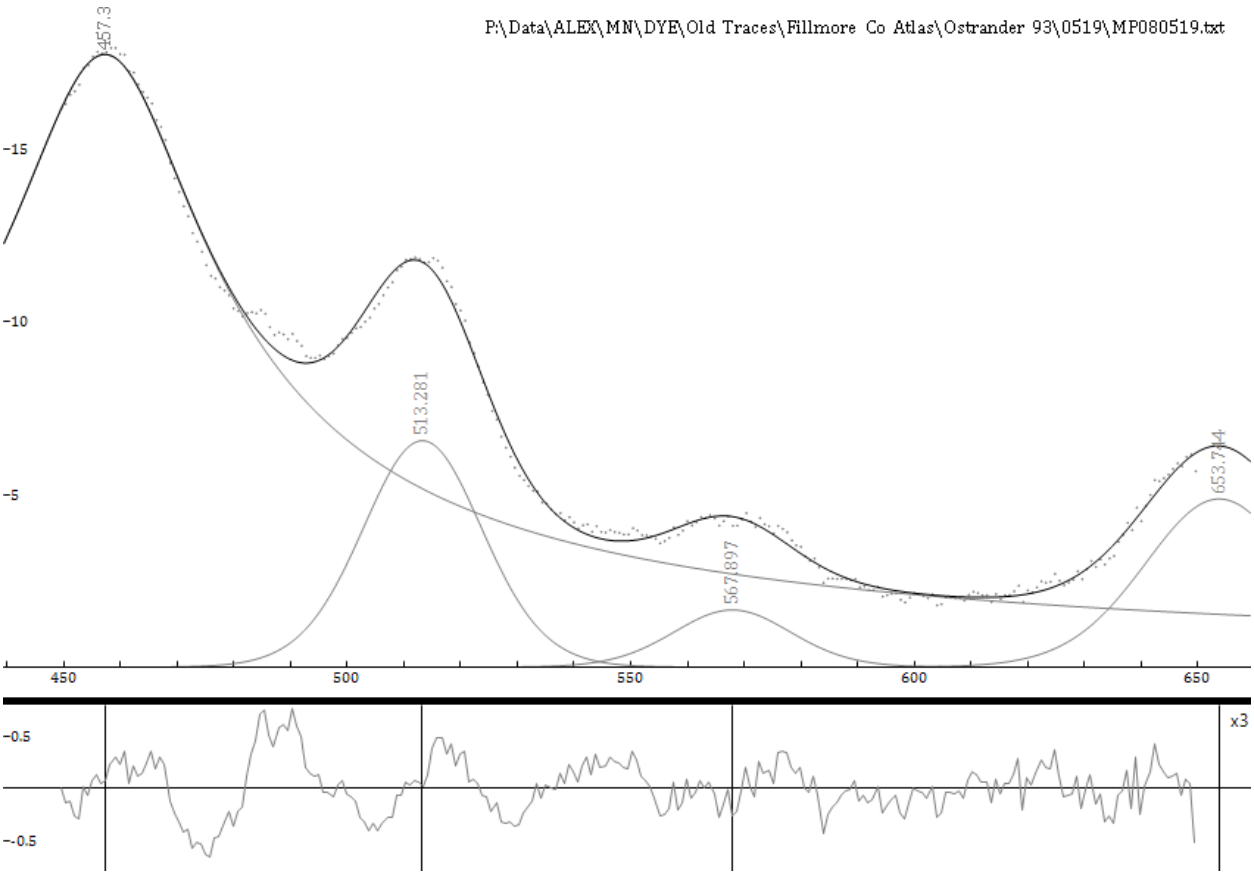
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	414.985	1.6032	178.822	85.4869	1.6032 414.985 42.7435 1.5
%_3 Pearson7	515.171	1.4238	28.4542	18.3775	1.4238 515.171 9.18873 10
%_10 Pearson7	648.8	0.623184	11.4898	16.9545	0.623184 648.8 8.47725 10
%_11 Pearson7	610.743	0.555307	95.8747	158.766	0.555307 610.743 79.3831 10



US 63 – Mile Post 8 930518

=-> info fit
WSSR=1.4965 DoF=237 WSSR/DoF=0.00631436 SSR=5.56359 R2=0.993106
=-> info peaks

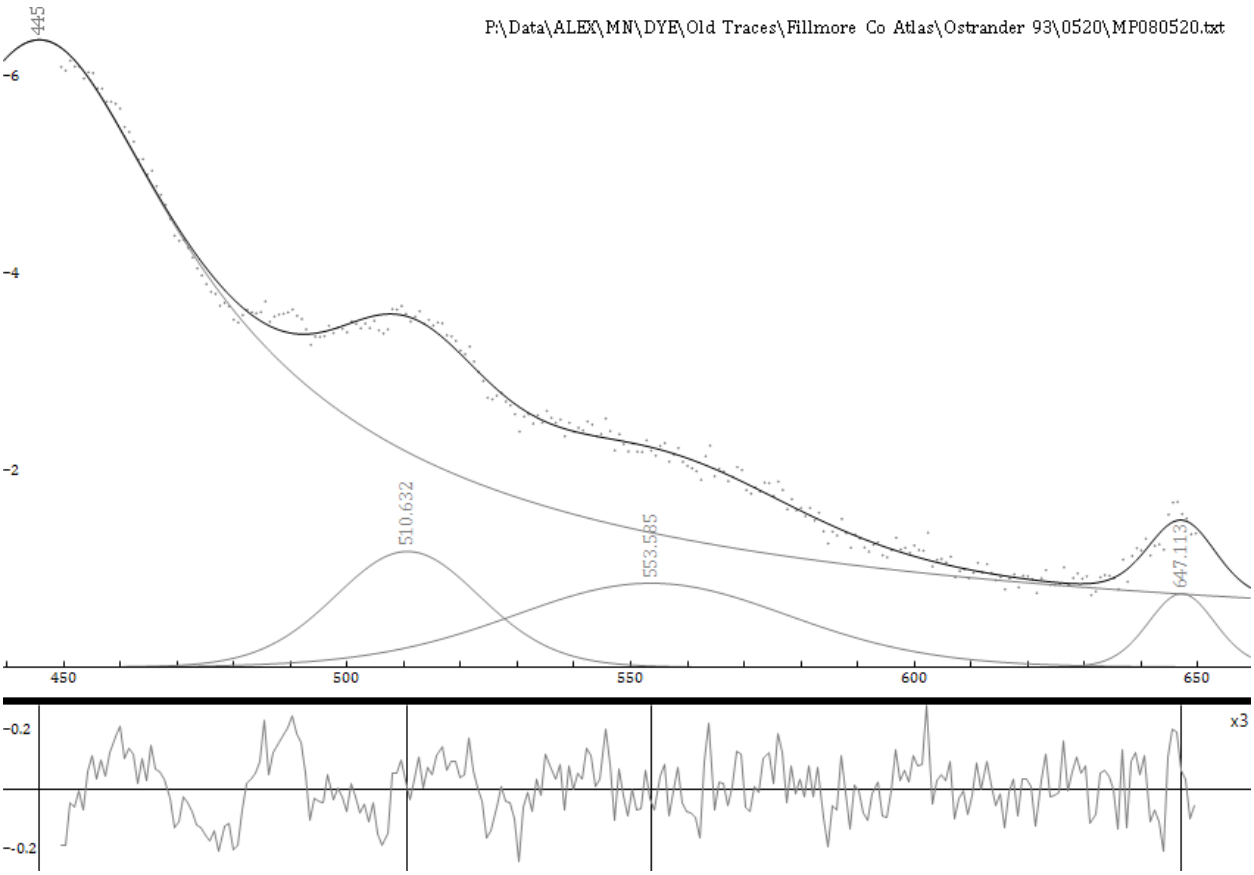
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	449.473	6.04649	499.978	63.3746	6.04649 449.473 31.6873 1.5
%_3 Pearson7	513.048	2.33404	63.9783	25.2065	2.33404 513.048 12.6032 10
%_10 Pearson7	648.243	6.63601	128.797	17.8478	6.63601 648.243 8.92392 10
%_11 Pearson7	557.87	1.56905	439.683	257.685	1.56905 557.87 128.843 10
%_1 Pearson7	567.378	0.512515	12.1703	21.8363	0.512515 567.378 10.9182 10



US 63 – Mile Post 8 930519

=-> info fit
WSSR=2.52955 DoF=239 WSSR/DoF=0.0105839 SSR=15.9578 R2=0.997117
=-> info peaks

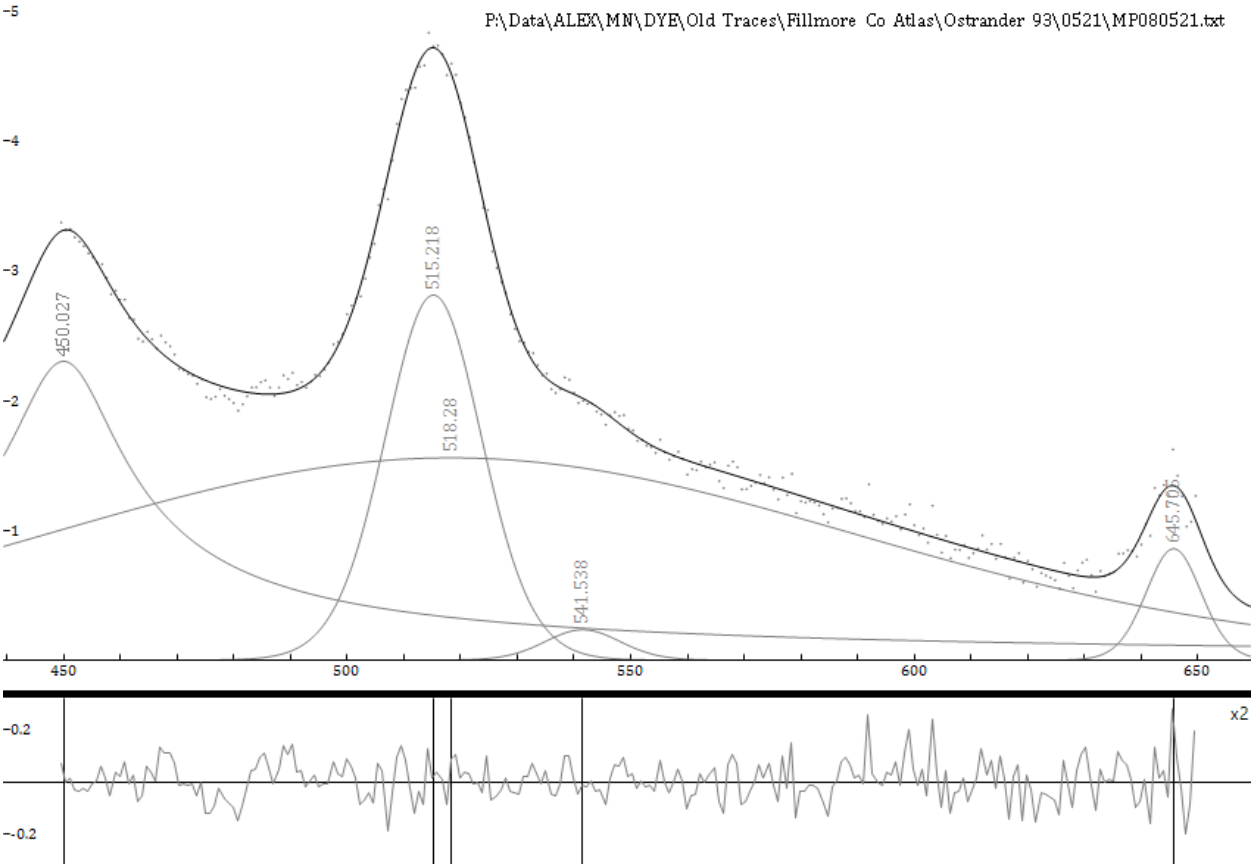
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	457.305	17.7477	x	59.0742	17.7477 457.305 29.5371 0.5
%_3 Pearson7	513.281	6.56322	178.331	24.9861	6.56322 513.281 12.493 10
%_10 Pearson7	653.744	4.87592	166.102	31.326	4.87592 653.744 15.663 10
%_1 Pearson7	567.897	1.66035	44.454	24.6206	1.66035 567.897 12.3103 10



US 63 – Mile Post 8 930520

=-> info fit
WSSR=1.1586 DoF=239 WSSR/DoF=0.0048477 SSR=2.45891 R2=0.995117
=-> info peaks

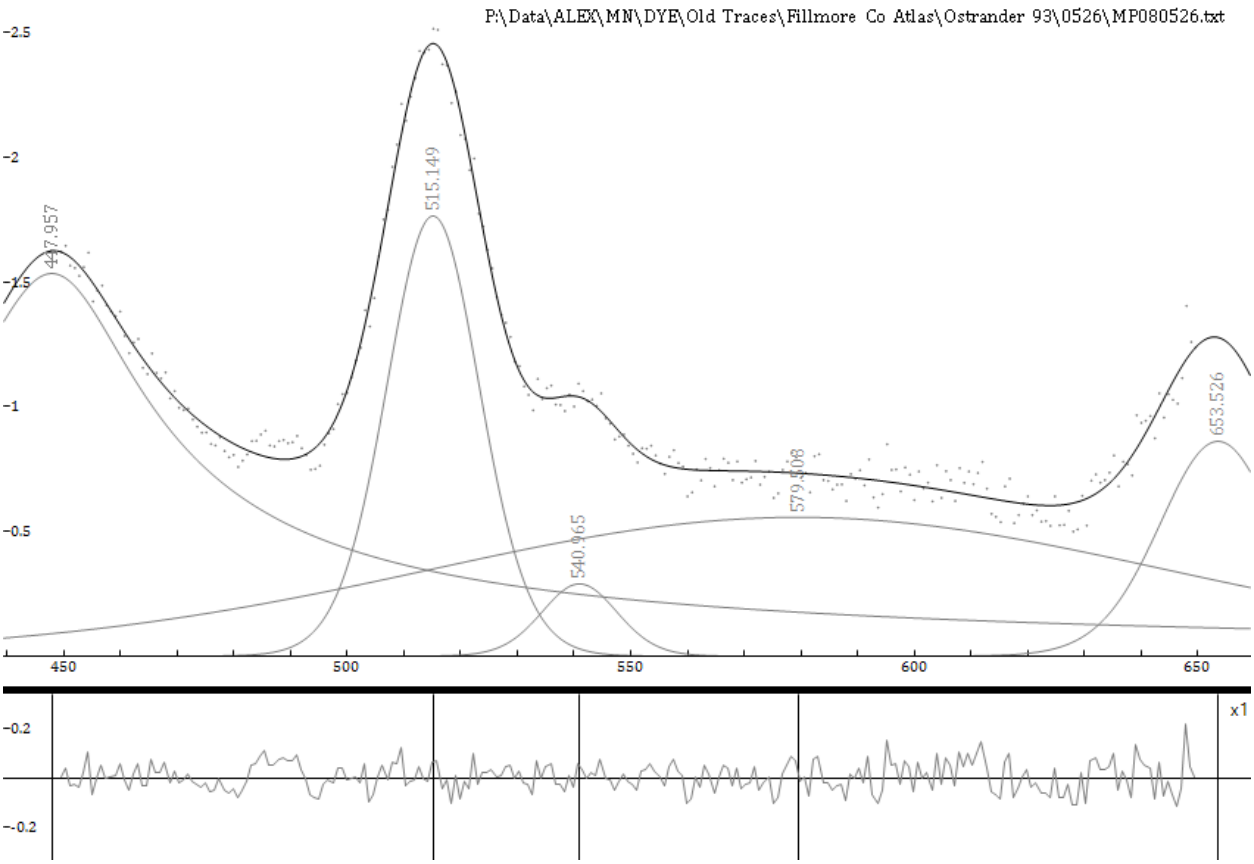
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	445.749	6.36839	x	82.0925	6.36839 445.749 41.0463 0.5
%_3 Pearson7	510.632	1.17609	38.998	30.4923	1.17609 510.632 15.2461 10
%_10 Pearson7	647.113	0.746885	11.3094	13.9242	0.746885 647.113 6.96211 10
%_1 Pearson7	553.585	0.85362	54.0738	58.2518	0.85362 553.585 29.1259 10



US 63 – Mile Post 8 930521

=-> info fit
WSSR=0.981094 DoF=236 WSSR/DoF=0.00415718 SSR=1.44908 R2=0.994645
=-> info peaks

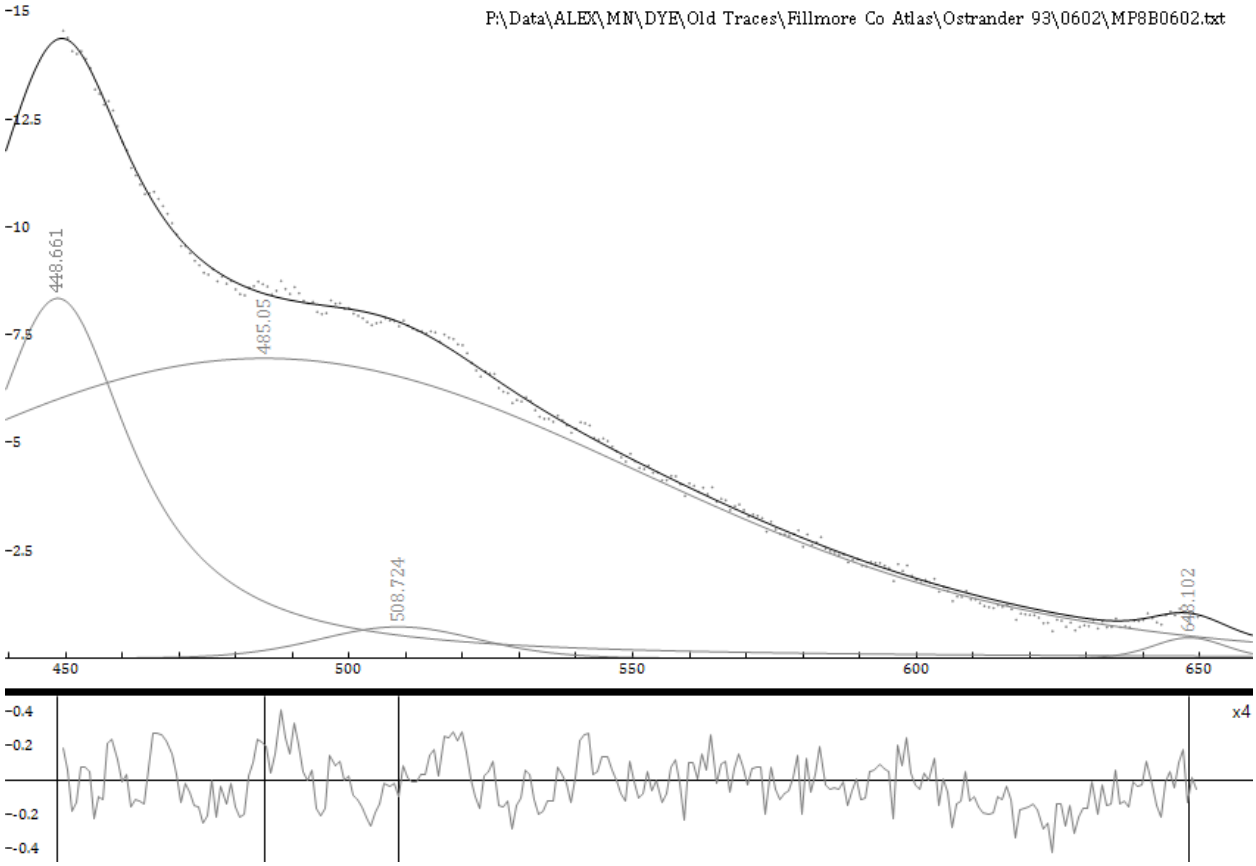
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	450.027	2.3039	x	34.3203	2.3039 450.027 17.1602 0.5
%_3 Pearson7	515.218	2.81428	61.8392	20.2062	2.81428 515.218 10.1031 10
%_10 Pearson7	645.705	0.859949	10.7593	11.5053	0.859949 645.705 5.75266 10
%_1 Pearson7	518.28	1.55999	294.441	173.565	1.55999 518.28 86.7825 10
%_4 Pearson7	541.538	0.235788	4.04641	15.781	0.235788 541.538 7.89051 10



US 63 – Mile Post 8 930526

=-> info fit
WSSR=0.731222 DoF=236 WSSR/DoF=0.0030984 SSR=0.80125 R2=0.984143
=-> info peaks

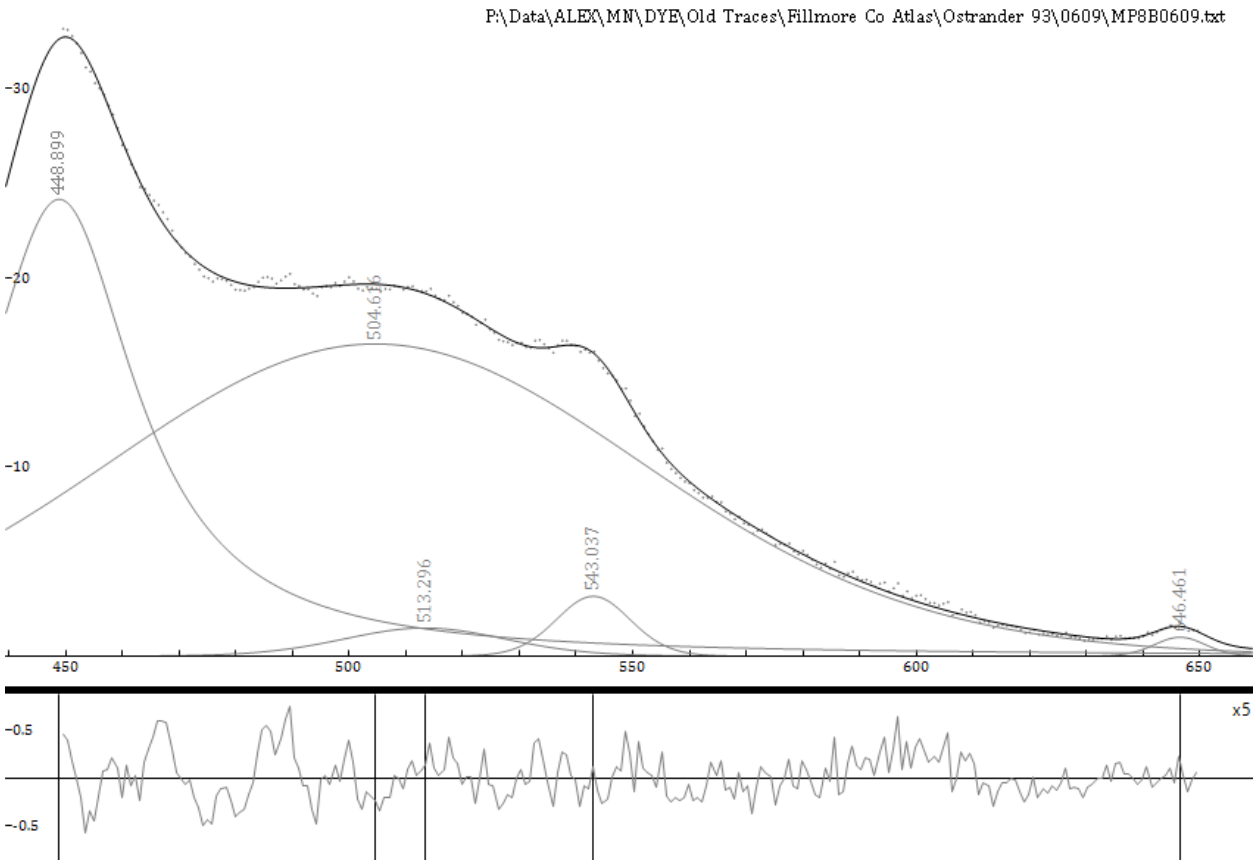
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	447.957	1.53423	x	52.9163	1.53423 447.957 26.4581 0.5
%_3 Pearson7	515.149	1.7648	37.4563	19.5172	1.7648 515.149 9.75859 10
%_10 Pearson7	653.526	0.861605	22.9965	24.5438	0.861605 653.526 12.2719 10
%_1 Pearson7	579.508	0.557042	95.7904	158.133	0.557042 579.508 79.0663 10
%_4 Pearson7	540.965	0.29015	4.97696	15.7735	0.29015 540.965 7.88674 10



US 63 – Mile Post 8 930602

=-> info fit
WSSR=2.1652 DoF=239 WSSR/DoF=0.00905943 SSR=5.35852 R2=0.998391
=-> info peaks

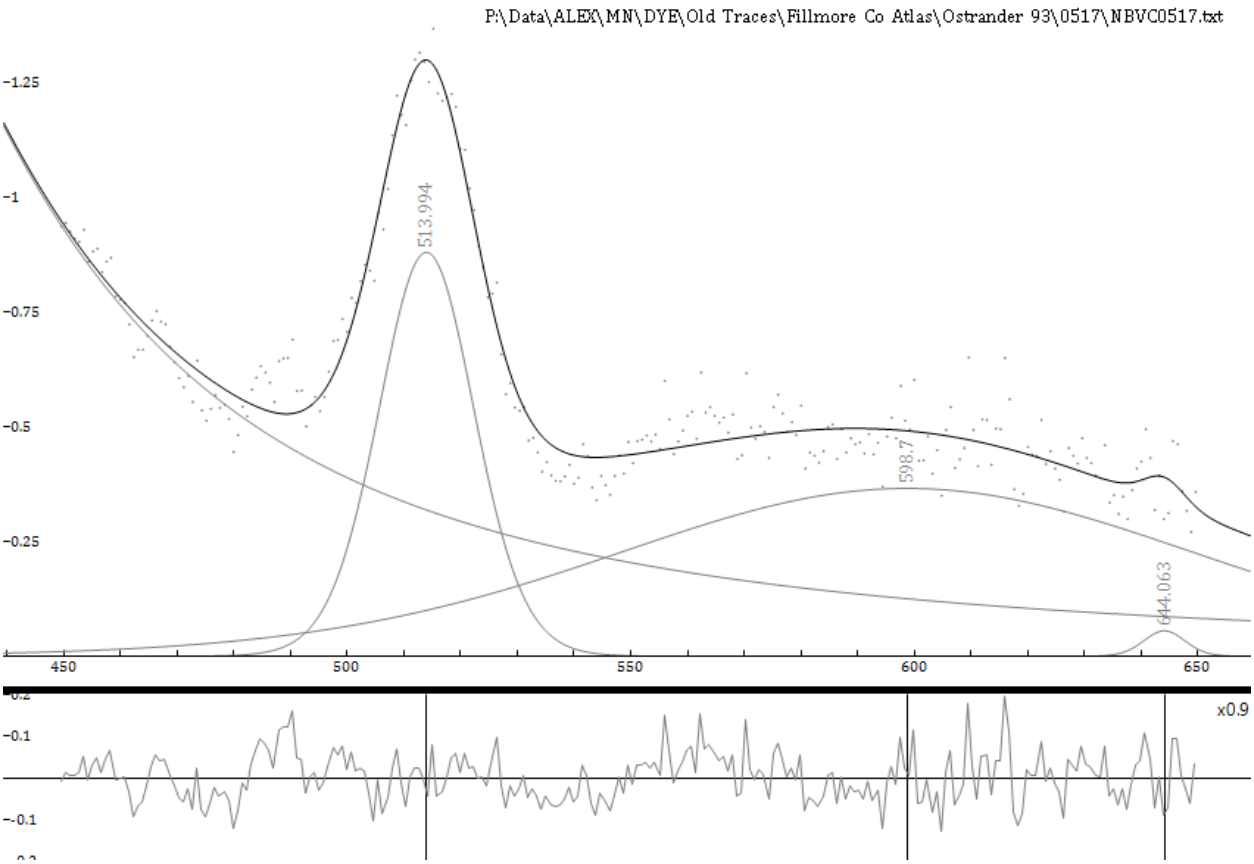
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	448.661	8.34514	412.691	31.4827	8.34514 448.661 15.7413 1
%_3 Pearson7	508.724	0.729542	26.1897	33.0117	0.729542 508.724 16.5059 10
%_10 Pearson7	648.102	0.477101	7.78605	15.007	0.477101 648.102 7.50351 10
%_1 Pearson7	485.05	6.95452	1214.33	160.568	6.95452 485.05 80.2838 10



US 63 – Mile Post 8 930609

=-> info fit
WSSR=1.8993 DoF=236 WSSR/DoF=0.00804787 SSR=13.8496 R2=0.99931
=-> info peaks

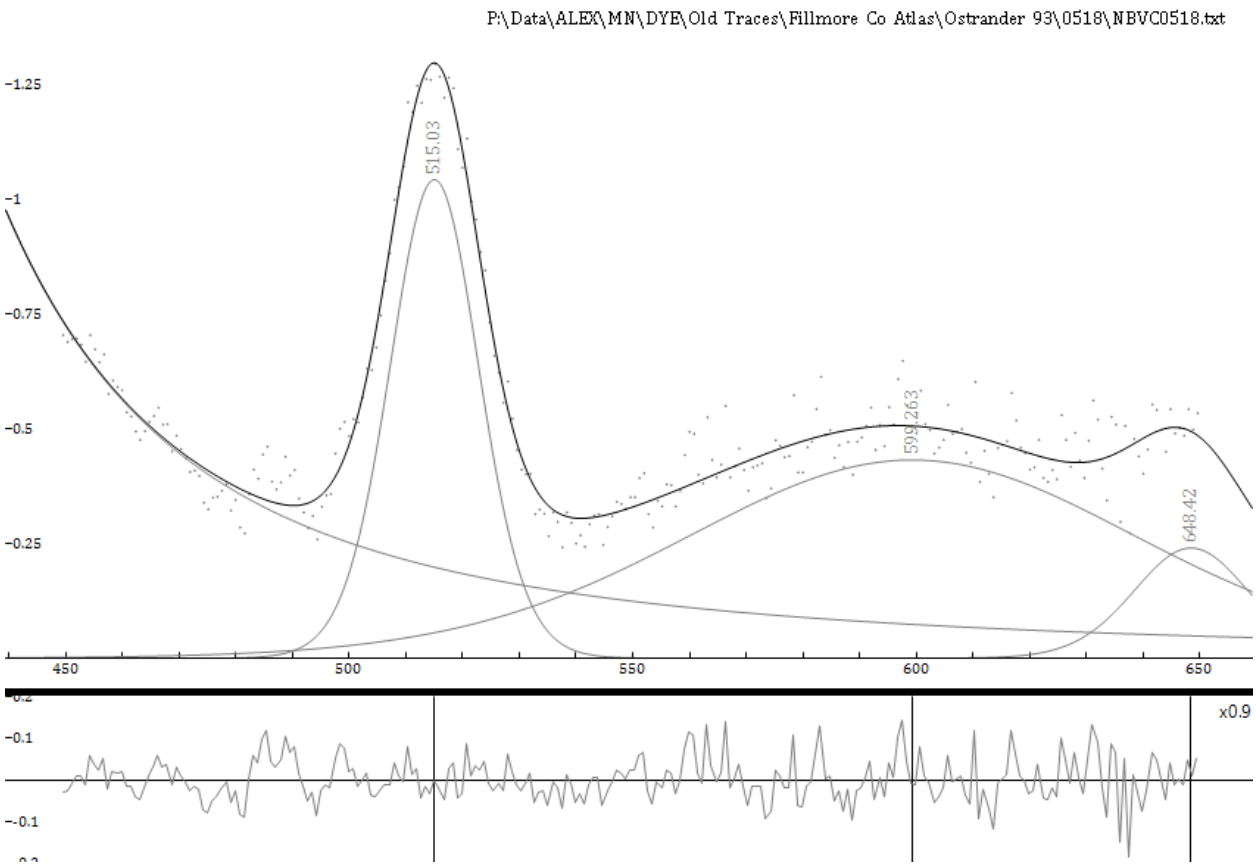
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	448.912	24.1027	1235.26	32.6266	24.1027 448.912 16.3133 1
%_3 Pearson7	513.284	1.49414	55.1084	33.9166	1.49414 513.284 16.9583 10
%_10 Pearson7	646.461	1.00671	11.7133	10.6995	1.00671 646.461 5.34974 10
%_1 Pearson7	504.593	16.491	2038.96	113.697	16.491 504.593 56.8484 10
%_5 Pearson7	543.035	3.16971	53.551	15.5359	3.16971 543.035 7.76793 10



North Beaver Creek 930517

=-> info fit
WSSR=0.842563 DoF=239 WSSR/DoF=0.00352537 SSR=0.848404 R2=0.93705
=-> info peaks

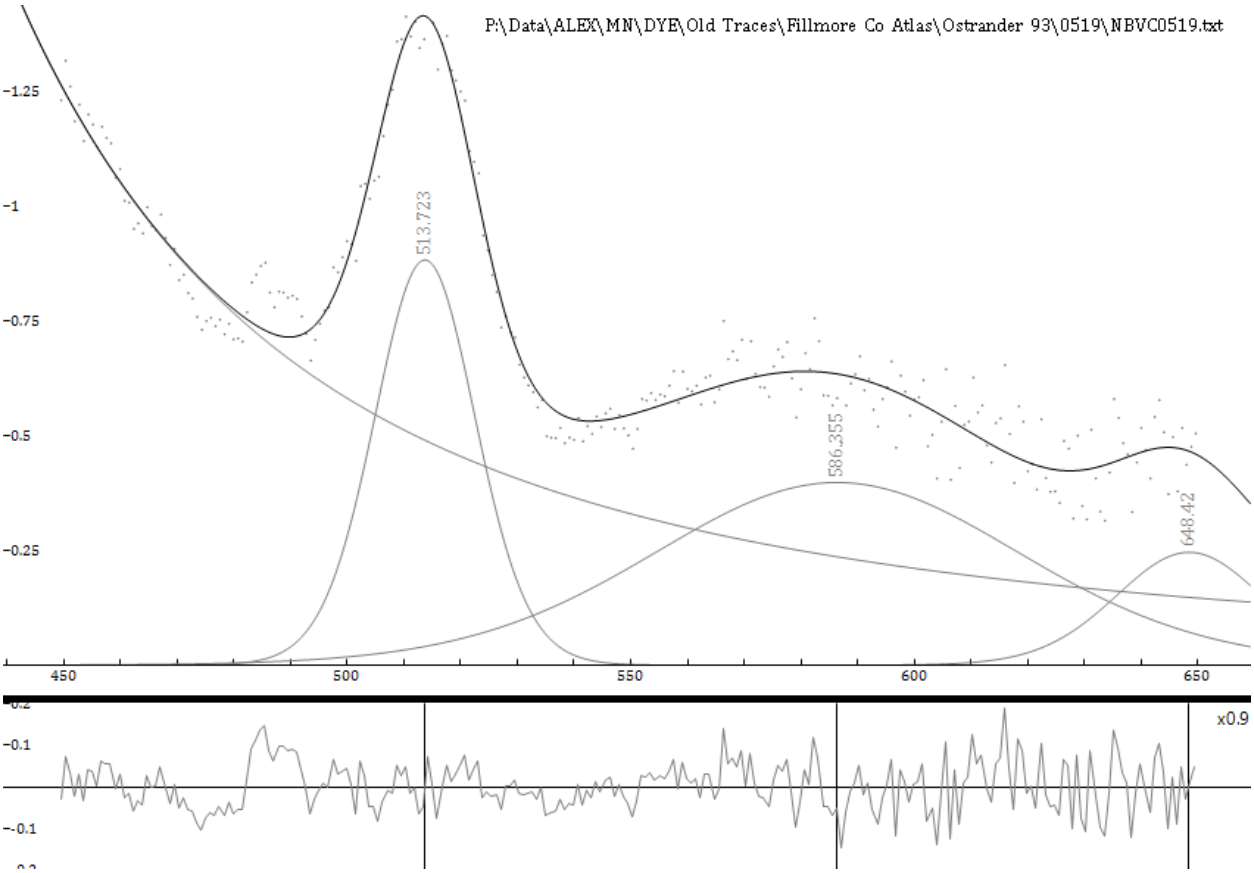
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	381.262	3.06538	437.515	90.8633	3.06538 381.262 45.4316 1
%_3 Pearson7	513.996	0.879592	19.0934	19.9613	0.879592 513.996 9.98064 10
%_10 Pearson7	644.074	0.0560226		0.523758	8.59715 0.0560226 644.074 4.29857 10
%_1 Pearson7	598.758	0.363172	47.918	121.332	0.363172 598.758 60.6658 10



North Beaver Creek 930518

=-> info fit
WSSR=0.670514 DoF=240 WSSR/DoF=0.00279381 SSR=0.67451 R2=0.9442
=-> info peaks

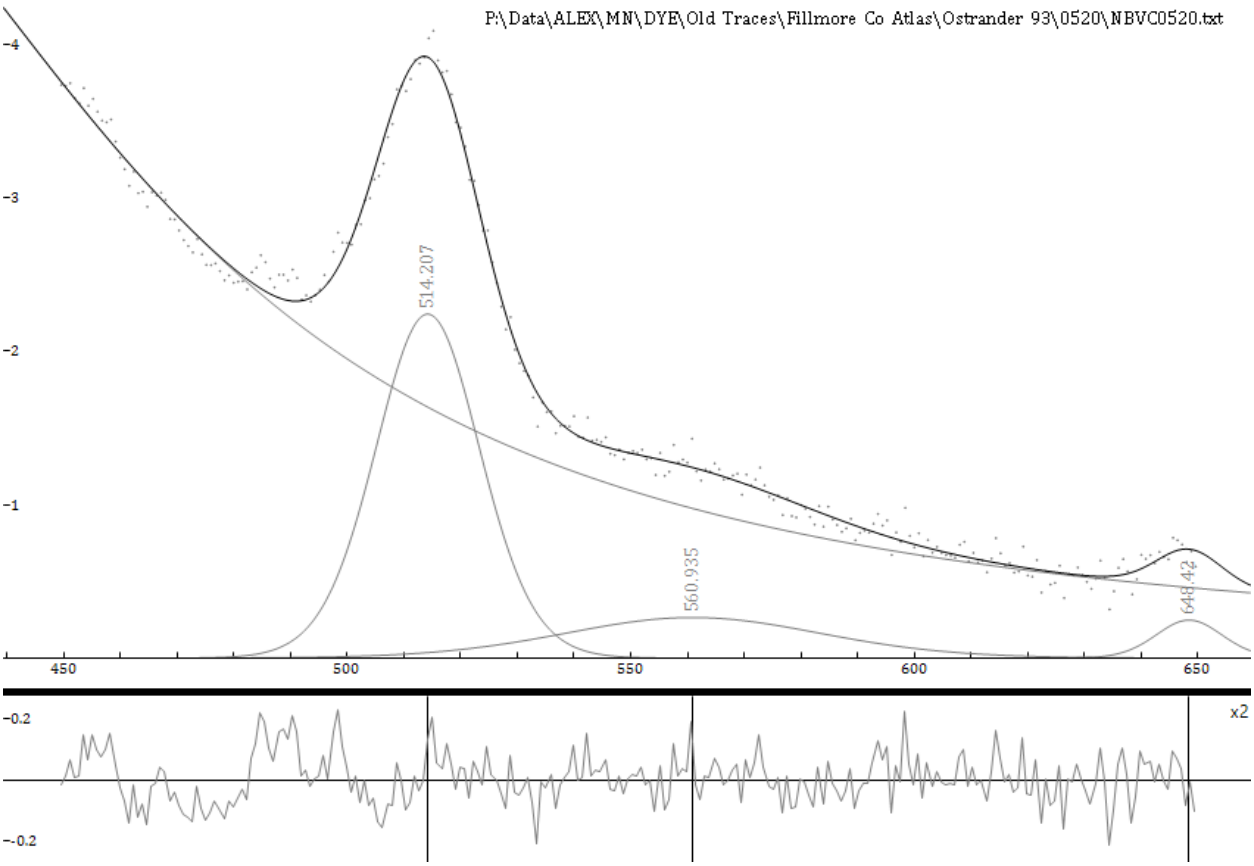
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	388.066	4.19347	372.952	56.6187	4.19347 388.066 28.3093 1
%_3 Pearson7	515.03	1.0428	21.0566	18.5685	1.0428 515.03 9.28423 10
%_10 Pearson7	648.42	0.240318	6.26813	23.985	0.240318 648.42 11.9925 10
%_1 Pearson7	599.263	0.431983	44.479	94.6838	0.431983 599.263 47.3419 10



North Beaver Creek 930519

=-> info fit
WSSR=0.856058 DoF=240 WSSR/DoF=0.00356691 SSR=0.870319 R2=0.952301
=-> info peaks

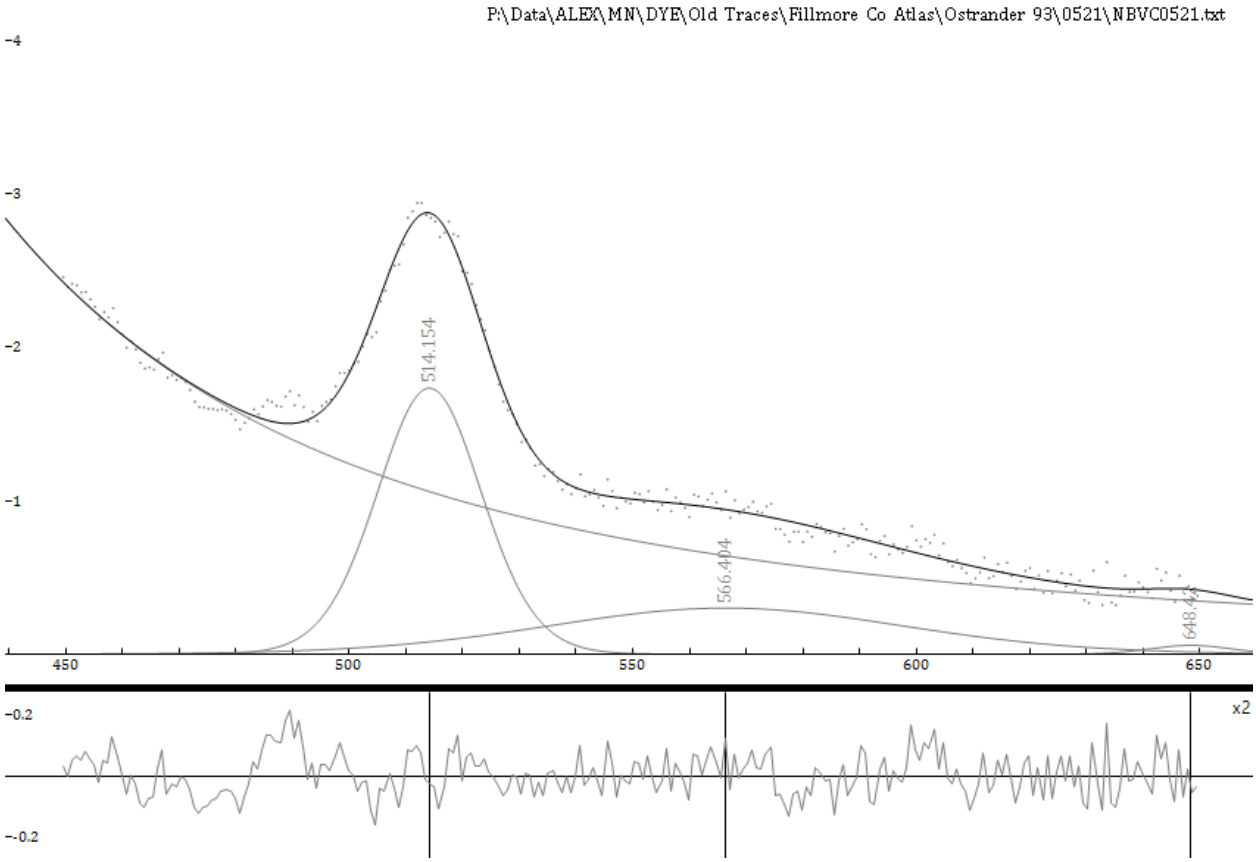
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	357.076	8.11202	1012.57	79.4648	8.11202 357.076 39.7324 1
%_3 Pearson7	513.723	0.882996	20.2591	21.0984	0.882996 513.723 10.5492 10
%_10 Pearson7	648.42	0.246146	8.2431	30.7953	0.246146 648.42 15.3976 10
%_1 Pearson7	586.355	0.398231	33.3807	77.0809	0.398231 586.355 38.5405 10



North Beaver Creek 930520

=-> info fit
WSSR=0.98129 DoF=240 WSSR/DoF=0.00408871 SSR=1.62385 R2=0.994561
=-> info peaks

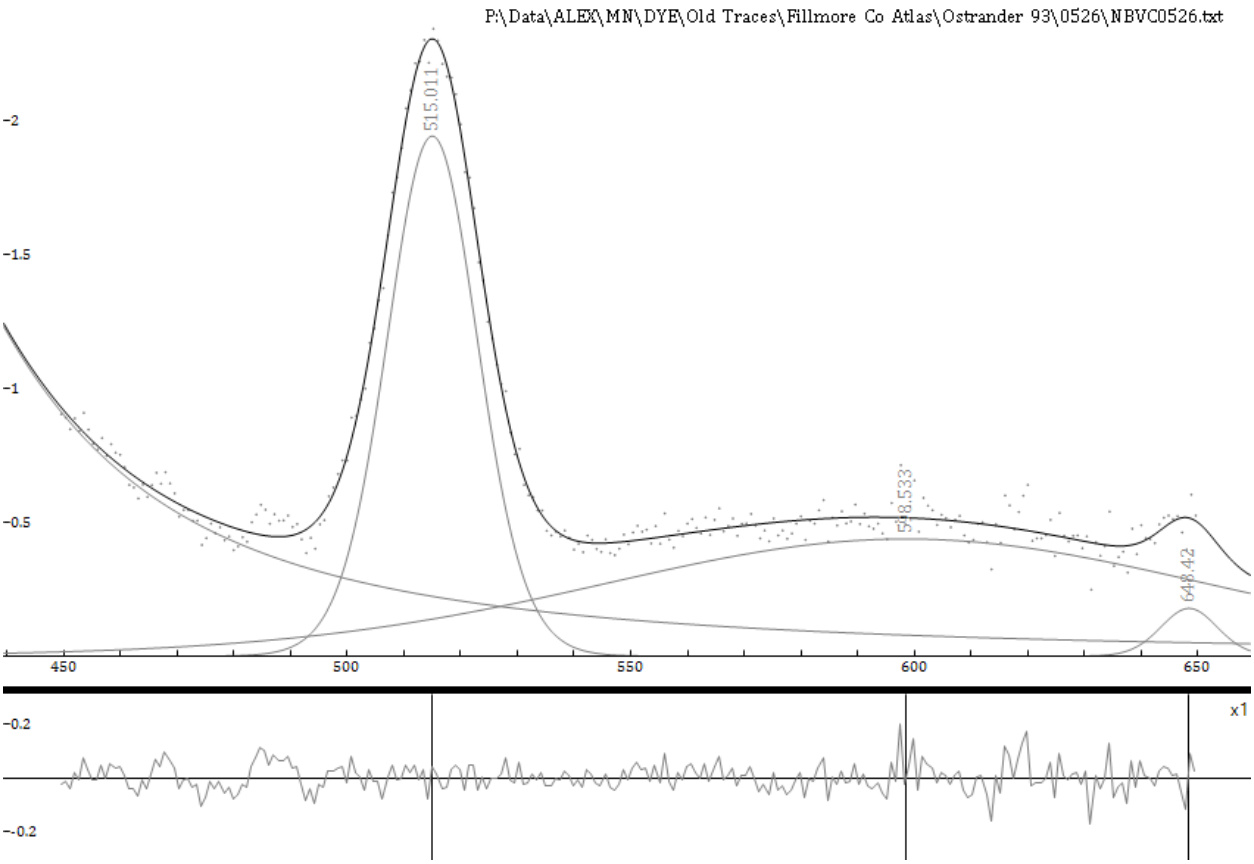
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	397.261	5.56079	1319.77	151.092	5.56079 397.261 75.5461 1
%_3 Pearson7	514.207	2.2428	53.0161	21.7373	2.2428 514.207 10.8686 10
%_10 Pearson7	648.42	0.249098	3.75151	13.8491	0.249098 648.42 6.92456 10
%_1 Pearson7	560.935	0.266065	15.5701	53.8135	0.266065 560.935 26.9067 10



North Beaver Creek 930521

=-> info fit
WSSR=0.90966 DoF=240 WSSR/DoF=0.00379025 SSR=1.17921 R2=0.990545
=-> info peaks

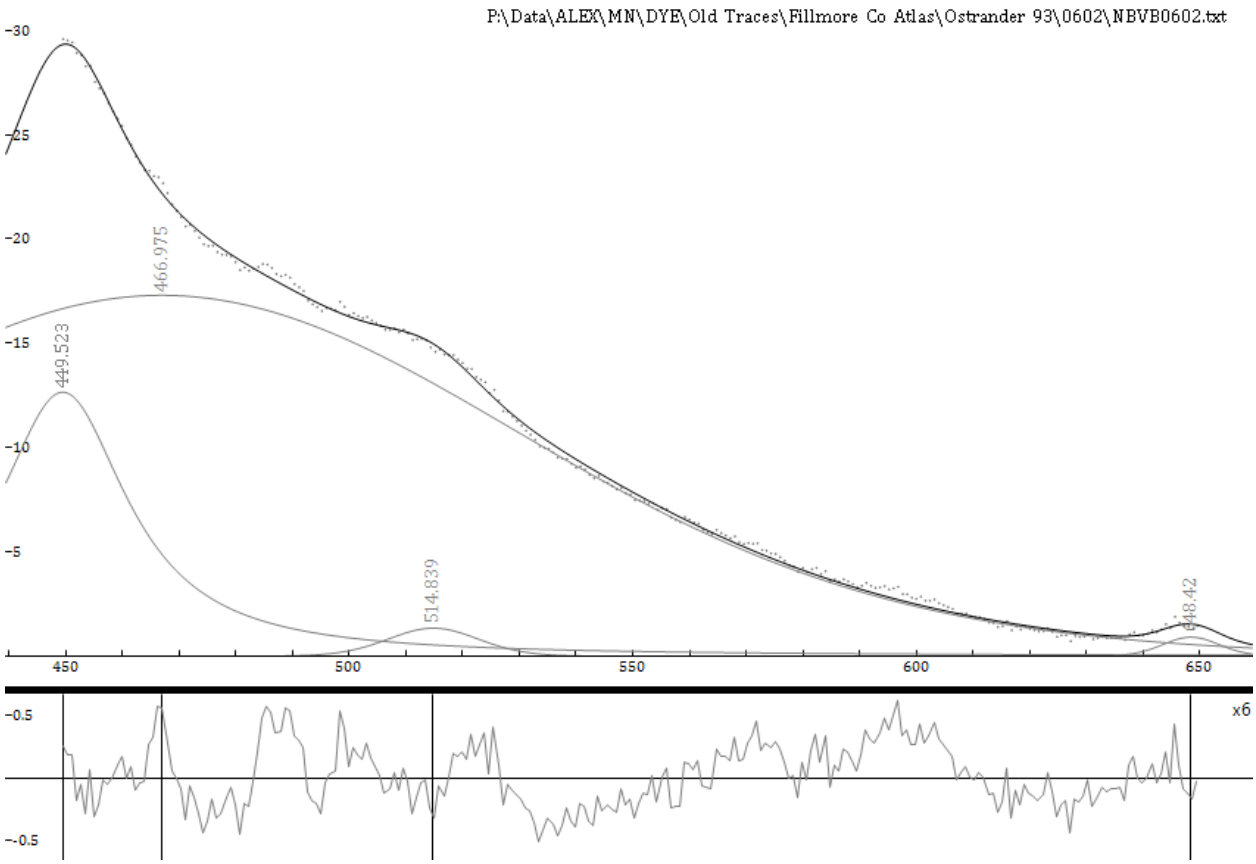
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	346.792	10.988	1888.27	109.402	10.988 346.792 54.7009 1
%_3 Pearson7	514.154	1.73433	41.0213	21.7503	1.73433 514.154 10.8752 10
%_10 Pearson7	648.42	0.0584219		1.08995	17.1561 0.0584219 648.42 8.57806 10
%_1 Pearson7	566.404	0.301481	24.5422	74.8584	0.301481 566.404 37.4292 10



North Beaver Creek 930526

=-> info fit
WSSR=0.644377 DoF=240 WSSR/DoF=0.00268491 SSR=0.662209 R2=0.986776
=-> info peaks

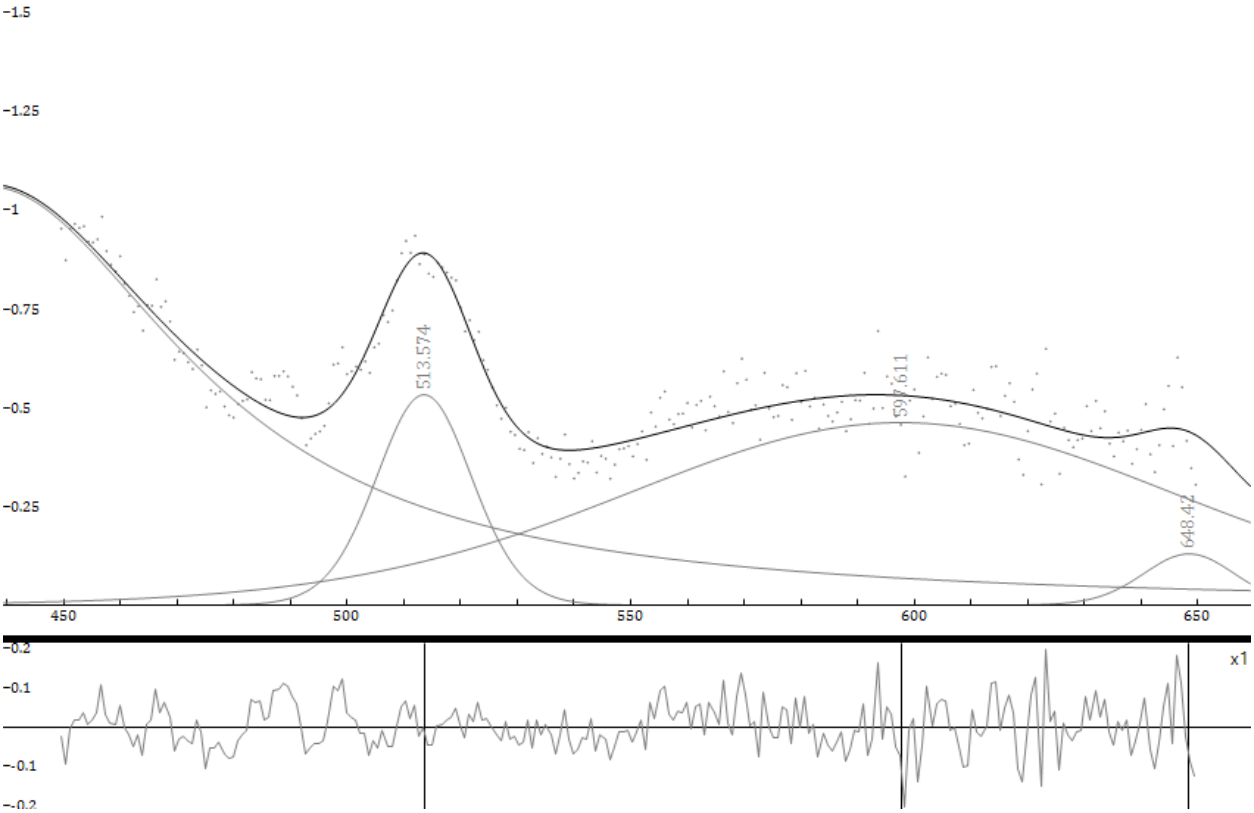
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	399.557	3.16085	316.838	63.8135	3.16085 399.557 31.9068 1
%_3 Pearson7	515.011	1.94415	39.9869	18.9136	1.94415 515.011 9.45681 10
%_10 Pearson7	648.42	0.179145	2.30185	11.8157	0.179145 648.42 5.90785 10
%_1 Pearson7	598.533	0.438435	61.1887	128.337	0.438435 598.533 64.1687 10



North Beaver Creek 930602

=-> info fit
WSSR=3.03832 DoF=240 WSSR/DoF=0.0126597 SSR=14.8175 R2=0.999097
=-> info peaks

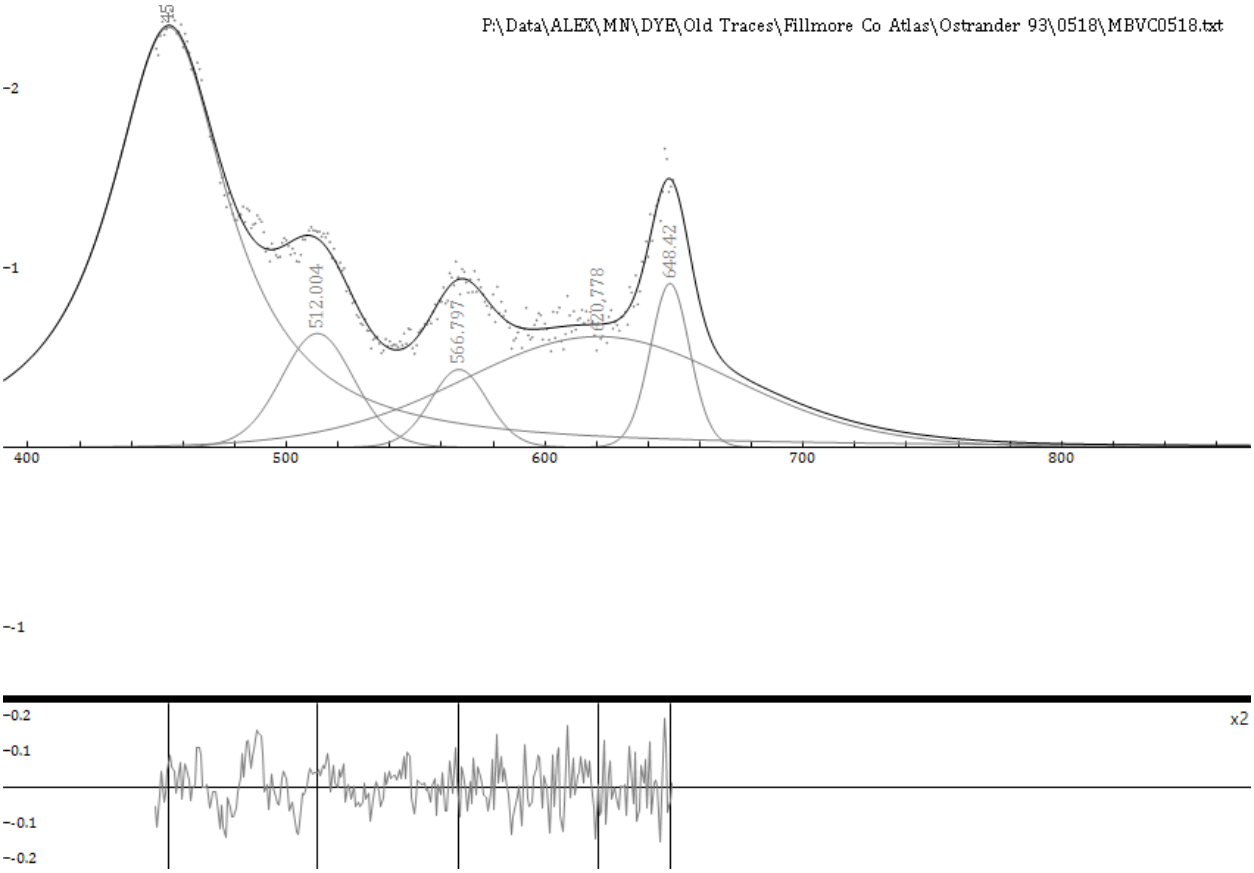
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	449.523	12.6597	551.441	27.7304	12.6597 449.523 13.8652 1
%_3 Pearson7	514.839	1.35039	27.8503	18.9653	1.35039 514.839 9.48263 10
%_10 Pearson7	648.42	0.9197	11.8641	11.8625	0.9197 648.42 5.93124 10
%_1 Pearson7	466.975	17.3007	2865.48	152.307	17.3007 466.975 76.1537 10



Middle Beaver Creek 930517

=-> info fit
WSSR=0.902179 DoF=240 WSSR/DoF=0.00375908 SSR=0.902179 R2=0.858157
=-> info peaks

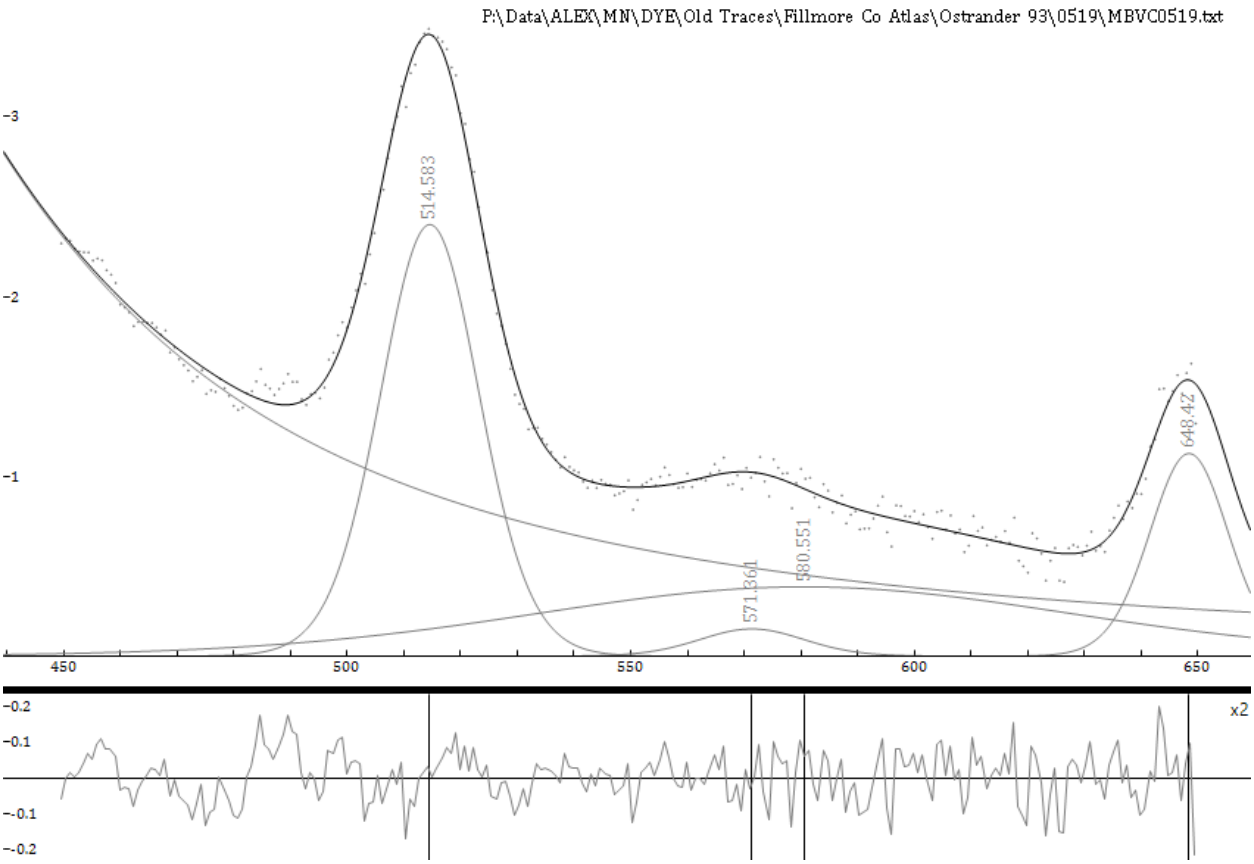
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	436.794	1.05964	141.132	84.7909	1.05964 436.794 42.3954 1
%_3 Pearson7	513.574	0.532671	11.5228	19.8924	0.532671 513.574 9.94619 10
%_10 Pearson7	648.42	0.130069	2.72067	19.2349	0.130069 648.42 9.61746 10
%_1 Pearson7	597.611	0.462178	57.8548	115.111	0.462178 597.611 57.5555 10



Middle Beaver Creek 930518

=-> info fit
WSSR=0.913295 DoF=237 WSSR/DoF=0.00385357 SSR=1.05072 R2=0.982174
=-> info peaks

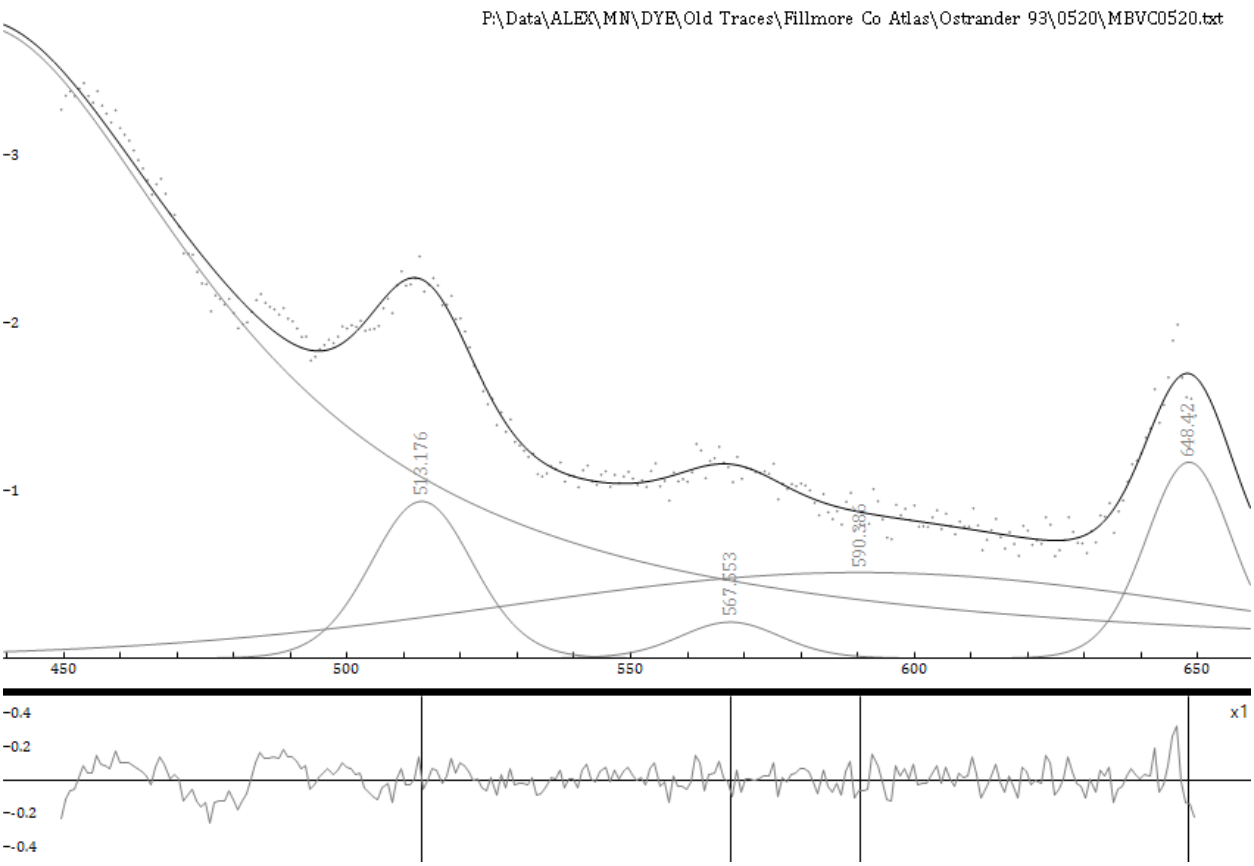
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	454.461	2.33883	204.133	55.5642	2.33883 454.461 27.7821 1
%_3 Pearson7	512.004	0.634748	22.9187	33.2028	0.634748 512.004 16.6014 10
%_10 Pearson7	648.42	0.913046	17.816	17.9434	0.913046 648.42 8.97171 10
%_1 Pearson7	620.778	0.61747	83.9617	125.041	0.61747 620.778 62.5205 10
%_6 Pearson7	566.797	0.434246	12.2753	25.9946	0.434246 566.797 12.9973 10



Middle Beaver Creek 930519

=-> info fit
WSSR=0.945357 DoF=237 WSSR/DoF=0.00398885 SSR=1.20869 R2=0.990905
=-> info peaks

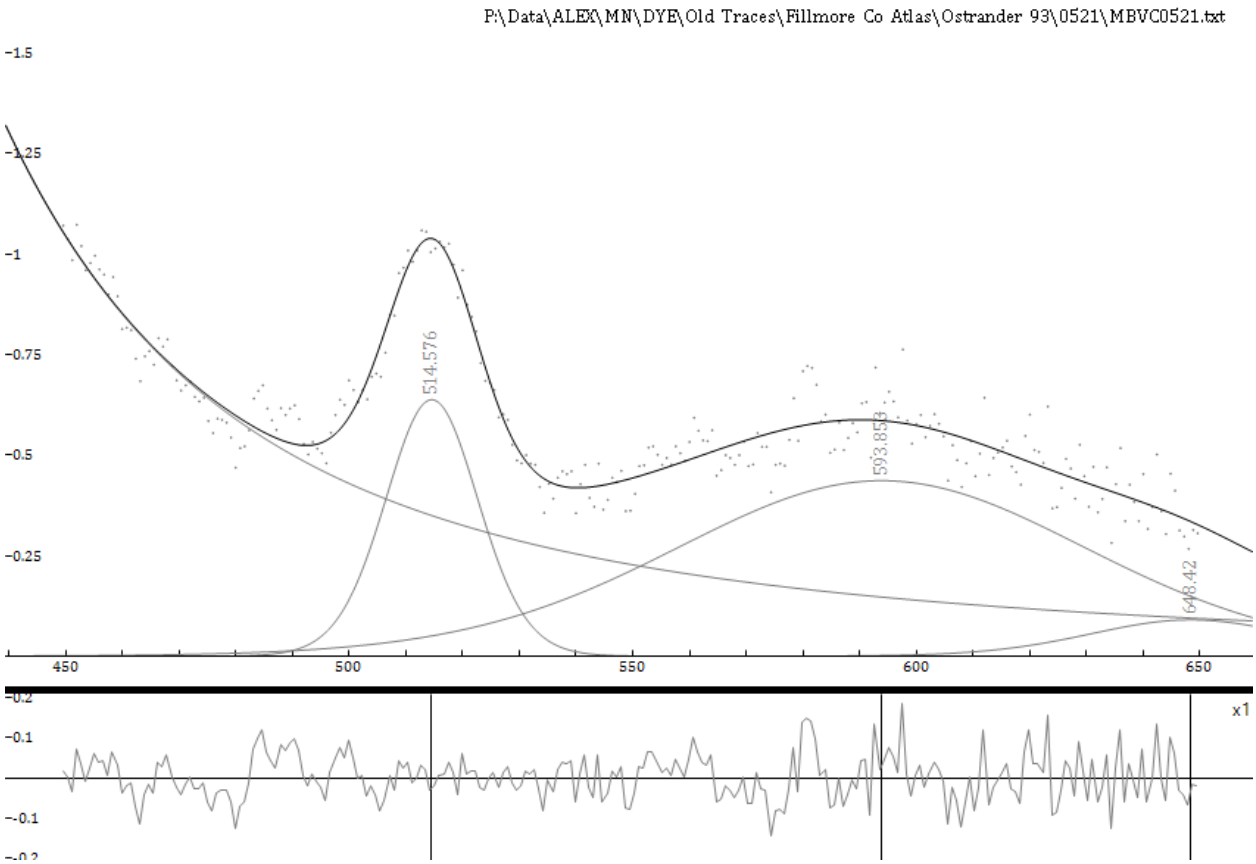
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	374.098	6.61583	1162.16	111.831	6.61583 374.098 55.9156 1
%_3 Pearson7	514.583	2.39976	53.8671	20.6416	2.39976 514.583 10.3208 10
%_10 Pearson7	648.42	1.12749	20.2035	16.478	1.12749 648.42 8.23898 10
%_1 Pearson7	580.551	0.386272	47.5345	113.162	0.386272 580.551 56.5812 10
%_6 Pearson7	571.361	0.152436	3.63816	21.9473	0.152436 571.361 10.9737 10



Middle Beaver Creek 930520

=-> info fit
WSSR=1.12388 DoF=237 WSSR/DoF=0.0047421 SSR=1.77991 R2=0.987291
=-> info peaks

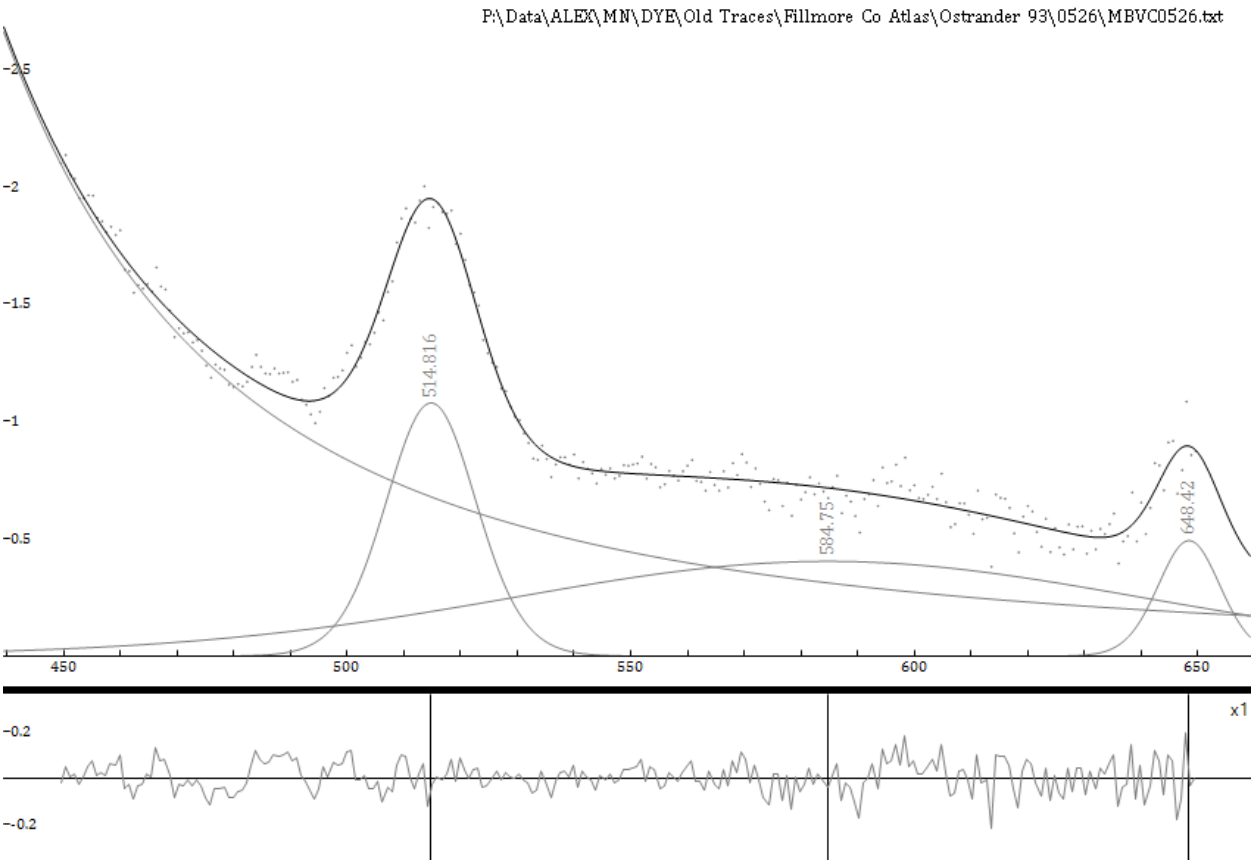
# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	434.467	3.78041	591.338	99.5811	3.78041 434.467 49.7906 1
%_3 Pearson7	513.176	0.936276	21.6537	21.2675	0.936276 513.176 10.6337 10
%_10 Pearson7	648.42	1.17037	22.9242	18.0119	1.17037 648.42 9.00593 10
%_1 Pearson7	590.386	0.511987	83.0537	149.172	0.511987 590.386 74.5859 10
%_6 Pearson7	567.553	0.215783	4.91451	20.9435	0.215783 567.553 10.4718 10



Middle Beaver Creek 930521

=-> info fit
WSSR=0.79602 DoF=240 WSSR/DoF=0.00331675 SSR=0.796526 R2=0.905702
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	377.016	4.69726	575.996	78.0647	4.69726 377.016 39.0324 1
%_3 Pearson7	514.576	0.638097	13.4362	19.3632	0.638097 514.576 9.6816 10
%_10 Pearson7	648.42	0.0907328		4.19921	42.5589 0.0907328 648.42 21.2795 10
%_1 Pearson7	593.853	0.436735	41.1867	86.7213	0.436735 593.853 43.3606 10



Middle Beaver Creek 930526

=-> info fit
WSSR=0.945763 DoF=240 WSSR/DoF=0.00394068 SSR=1.04363 R2=0.978569
=-> info peaks

# PeakType	Center	Height	Area	FWHM	parameters...
%_2 Pearson7	372.488	15.5566	1485.13	60.7759	15.5566 372.488 30.388 1
%_3 Pearson7	514.816	1.07768	22.0988	18.8566	1.07768 514.816 9.4283 10
%_10 Pearson7	648.42	0.492086	6.95599	12.9989	0.492086 648.42 6.49943 10
%_1 Pearson7	584.75	0.40395	58.9036	134.091	0.40395 584.75 67.0457 10